The Environmental Paper Listening Study

Chapter Five: Sustainable Forest Issues

Prepared by
CONSERVATREE
Susan Kinsella

in collaboration with
NATIONAL WILDLIFE FEDERATION
Stacy Brown
Markelle Smith

October 8, 2004

http://www.PaperListeningStudy.org

CONSERVATREE

Attn: Susan Kinsella, Gerard Gleason
100 Second Avenue
San Francisco, CA 94118
415/721-4230
paper@conservatree.org
http://www.conservatree.org

Conservatree is a nonprofit catalyst and advocate for ecologically sustainable paper markets, combining environmental expertise with paper industry and technical proficiency. It provides practical tools and realistic strategies for successful conversion to environmentally sound and sustainable papers.

Conservatree began in 1976 as the for-profit Conservatree Paper Company, specializing in identifying, developing and supplying commercial quantities and qualities of cutting edge recycled printing and writing papers. After the company closed in 1997, Susan Kinsella and Gerard Gleason converted its information and advocacy mission to an independent nonprofit project of The Tides Center. It does not sell paper, does not represent any paper company or distributor, and networks with people with all types of perspectives on environmental paper issues.

As director of the Listening Study, Conservatree creates partnerships, conducts interviews, researches reports and tests, oversees the comprehensiveness of the information, writes the synopses, and compiles and publishes the reports.

NATIONAL WILDLIFE FEDERATION

Attn: Stacy Brown
58 State Street
Montpelier, VT 05602
802-229-0650
browns@nwf.org
http://www.nwf.org

The National Wildlife Federation (NWF) is a not-for-profit conservation education and advocacy organization. NWF was founded in 1936 as a nationwide federation of grassroots conservation groups, and has since emerged as the nation's leading grassroots conservation organization, with an extensive network of members and supporters and 47 affiliated organizations throughout the United States and its territories. Combining the local knowledge and focus of its strong grassroots network with the perspective, resources and strength of a national organization, the National Wildlife Federation generates unparalleled support for wildlife, wild places and a healthy environment.

NWF partners with its affiliates and other like-minded organizations to protect and restore wildlife habitats and biodiversity. Our conservation work focuses on the three broad areas of land stewardship, water resources protection and wildlife conservation.

NWF's forestry program is defined largely by work with private landowners, restoration of habitat and ecosystem processes, and support for market incentives encouraging forest conservation.

Sustainable Forest Issues
Environmental Paper Listening Study

Table of Contents

PROJECT OVERVIEW

THE LISTENING STUDY

Questions about environmental printing and writing papers have proliferated over the past 15 years or more. Arguments about some of the issues have been intense and often contentious. On some issues, industry and environmentalists have become deadlocked and purchasers have become confused or uncertain about the "right" answers to guide them in their paper choices. In too many cases, this has resulted in no progress at all.

What if, instead, there were a place for everyone to discuss these issues in a respectful, thoughtful, candid and objective way? What if each of us were able to step back, take a deep breath, and *listen* . . . . Get a better idea of the whole, multi-faceted complexity of each issue. Hear what's behind each argument and understand better why each side holds fast to it?

What if paper purchasers and environmental paper advocates could get the benefit of the latest know-how from paper and equipment manufacturers, printers and other paper experts – conversations many otherwise have little access to? What if purchasers and industry representatives could see the in-depth research and thinking behind many of the environmental arguments? What if all of us had a place where we could truly *"listen"* to each other without feeling that that jeopardized our own position?

That is the purpose of the Listening Study. Questions of environmental impacts, technology and production are too big, too complex, and have too many effects on the larger society to be decided by only one side of an argument. Rather, and especially with arguments as rancorous as many have been within environmental paper issues, each side generally has a piece of the truth. Success only results from finding a way to put those pieces together.

In order to see what each of these pieces of the truth is, in order to start putting them together, in order to find a way to resolve them, we need to lay out all the different aspects and arguments, with value and respect for each, so that all of us are on the same – very large – page. Then we can begin to make sense of it all and find a way through.

Providing that kind of "place," facilitating that kind of dialog, is the purpose of the Listening Study, a project of the nonprofit advocacy organization, Conservatree. Funded by grants from the U.S. Environmental Protection Agency and the Weeden Foundation, the Listening Study is being carried out with help of nonprofit research collaborators such as the Recycled Paper Coalition, Fiber Futures, INFORM, and the National Wildlife Federation.

What the Listening Study Is

- A representation of the broad range of perspectives on many of the most contentious arguments or questions regarding environmental papers today,
- An opportunity for all sides to "listen" to the others, to hear why opponents believe their point of view cannot be ignored,
- A place for laying arguments on the issues "side-by-side" so that each proponent has a more complete understanding of others' thinking, especially some of the nuances that often escape notice,
- A potential for unraveling and discussing "knots" - arguments that have become so heated they're almost "black holes," with each side frequently unable to hear the others,
- A belief that rational presentation of views and perspectives will help sift through opposing arguments to find reliable foundations for building resolution,
- A belief that many of those interested in these questions have not had sufficient access to the wealth of knowledge and studies that underlie perspectives on many of these questions.

What the Listening Study Is Not

- A popularity contest. A position stated by many respondents suggests that it is widespread and essential to consider in any deliberations, but it does not automatically mean it is the "right" one,

- A definitive study pointing to the "right" answer. In fact, the "right" answer might turn out to be a composite of two or more listed here, or something that no one has yet identified.

Goals of the Listening Study

- Provide as complete a picture as possible for each issue, in order to get everyone "on the same page" about how others are thinking and why they're arguing their points,

- Pinpoint where the obstacles are to environmental paper development and clarify what steps could to be taken next towards either resolution or more resolution-oriented discussions between parties affected,

- Develop more paths of communication between those with differing opinions,

- Develop consensus on specific issues when possible,

- Catalyze research, technical development, education programs and discussions to help resolve issues and move environmental paper development forward,

- Provide thorough data sets for discussing issues,

- Get people talking about environmental paper issues,

- Let people hear the whole conversation – most don't have the opportunity to ask all these questions of people at paper mills, printers, environmental groups, and more.

Caveats

- Statements in Listening Study compilations reflect beliefs, opinions, experience and expertise. In some cases, the technical statements conflict. Even these differences are important. Much of the technical information in the Listening Study is cutting edge. Still, some statements may represent information that others consider debatable or inaccurate, some statements may represent outdated but still cited studies (although older studies may well still represent currently reliable information), some may change with new information, and some may be addressing different aspects of similar questions. These differences are important to record as part of sorting out what information needs to be clarified. Readers should evaluate technical statements by date (when relevant and available), by source and by comparison to other information available, as well as recognize that there may be a need for more definitive technical information on some questions.

  In particular, readers should keep in mind that this is not a study to determine ultimate answers. Rather, it intends to lay out the wide range of perspectives, knowledge and beliefs that must be taken into account in order to answer or resolve the questions. Please read the whole presentation on a question in order to evaluate as complete a picture as possible.

- If you find that a point, perspective or information is missing, please provide it to us, or let us know who could provide it.

- Some quotes are identified only by the respondents' relationship to the question – what specific type of manufacturer or service company they may be from, or what type of office they work in. This is because some respondents could not provide public comments on behalf of their organization, or in some cases because they *are* providing public comments on behalf of their organization. The Listening Study is focused on representative perspectives on these issues, not on individuals or specific companies. Therefore, we believe that even those quotes that are not publicly identified are

valuable because they represent a point of view that is undoubtedly shared by many more as part of the concern under discussion. We provide as much identification as respondents are willing to approve, in order to give readers as much information to assist in their evaluation as possible. This covers the range of some respondents approving full inclusion of names, titles and organizations, to others wanting only their organizations identified, to others wishing only their work sector to be identified. All are appreciated.

- We include Conservatree's perspectives on some questions, as well. We think it is appropriate to add our opinions based on experience over decades of interaction with environmental paper markets, both to include our expertise but also to give the reader a basis for evaluating our biases. Although we hold opinions on many questions in the Listening Study, our intent is to express them only in clearly identified quotes, similar to everyone else's opportunities to comment. In the rest of each report, we hope that the body of quotes speaks for itself, without filtering through our lens. If you believe we did not succeed at that, please let us know so we can correct it.

PLEASE JOIN THE LISTENING STUDY DISCUSSION!

E-mail Listen@conservatree.org

PURPOSE OF EXECUTIVE SUMMARY SYNOPSIS

The original Listening Study plan called for simply listing all the responses we received to each question. But as we collected more and more answers from people, we realized that many, if not most, readers would appreciate a synopsis of what these responses reveal. Most people are unlikely to read through dozens of pages of discussion and answers for each report. The challenge, though, is to present the information contained in the responses in as unbiased a manner as possible.

Of course, the original responses are also included, for those who want to make their own evaluations. In fact, we encourage people to read through the entire collection of responses. There is a wealth of information in them, and no synopsis can do them justice.

We expect the publication of this report to elicit more responses on this question, as readers realize that information has been left out, or some responses need to be given more weight, or discussions need more clarity. We regard it as an initial draft, and welcome your comments and additions. This current executive summary, therefore, is likely to change in future editions of this report as more information is added. We will publish new reports as additional comments are received that change or enhance the information here. Each edition will be dated so that readers can identify the latest edition.

EXECUTIVE SUMMARY

"I believe that trees are the answer to a lot of questions about our future." So says Dr. Patrick Moore, the host of the video *Trees Are the Answer*. Those words could speak for virtually every respondent in this portion of the Listening Study. But the meaning of those words would be very different for nearly everyone. Therein lies the dilemma surrounding forest issues and paper.

This section of the Listening Study reports on debates about forest issues that impact papermaking. Since forest fiber is the primary ingredient in paper in most parts of the world, and particularly in North America and Europe, the management of forests to supply the papermaking industry is an integral topic for discussion. Does the paper we use come from trees harvested from sustainably managed forests? How do we know? Should we continue cutting trees to make paper? To answer challenging questions like these, the Listening Study conducted extensive interviews with experts in the field and surveyed dozens of books, reports, studies, and websites.

Ironically, almost all the responses to date have been quite calm and measured, which surprises us since forest issues are some of the most hard-fought and rancorous of all the environmental paper arguments. Nevertheless, the comments in this report lay out a wide variety of ways to view similar situations.

We at Conservatree also realized over time, in reading through the answers, that our original questions were inadequate. While those were the questions we most often had heard from paper purchasers and others when we first wrote them down three years ago, we have learned a lot more about forest issues since then. It has become obvious to us that the questions we posed about forest fibers only get at a portion of the debate and much more remains to be discussed. So we will follow this summary with more of the questions about which we would like to hear people's opinions, in addition to the good start the current questions present.

Sustainable Forest Management

A logical first place to start when discussing sustainable forest issues is to define sustainable forest management. When asked what this term means, respondents provided wide-ranging answers that contained some conceptual similarities. For example, the Northern Forest Alliance referenced sustained yield concepts in their definition, "meeting the needs of the present without compromising the ability of future generations to meet their own needs." Victoria Mills at Environmental Defense focused on ecological integrity, defining sustainable forest management as "protecting *all* values of the forest – not just timber production, but also water quality, wildlife habitat, preservation of natural forest ecosystems and conservation of biodiversity." The majority of respondents indicated that forests must be managed to fulfill a variety of ecological, economic, and social functions now and into the future. The United National General Assembly also cautioned that, "Appropriate measures should be taken to protect forests against harmful effects of pollution, including air-borne pollution, fires, pests and diseases, in order to maintain their full multiple value."

Maureen Smith, author of *The U.S. Paper Industry and Sustainable Production*, suggests that, even with complex definitions, we are still a long way from truly understanding what sustainability means in forests: "Although the value of timber as a commodity can be measured, forests cannot be similarly deconstructed into simple economic terms despite the best efforts of diligent resource economists. Increasingly in recent years, there have been theoretical attempts to quantify present and future values of forest biodiversity, the value of (poorly understood) "ecosystem services" such as climate and watershed regulation, as well as the amenity (recreational) and even religious and cultural values of forests. Not surprisingly, such attempts have failed to do more than suggest the vast dimensions of our ignorance."

Certification

Respondents agreed that certification is a reliable method of verifying that a forest has been sustainably managed, although the type of certification varied. The two most often mentioned are the Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC) certification schemes.

SFI was introduced by the American Forest and Paper Association and is often used by the paper industry to establish that their forest practices are sustainable. SFI proponents state that this program provides comprehensive third-party verification of sustainable wood procurement practices and promotes reforestation.

Independent auditors who use environmental, social, and economic criteria to assess sustainability conduct FSC-certification. Supporters of FSC-certification assert that FSC uses sufficiently rigorous standards, addresses all ecological, economic, and social components of sustainability, and is truly independent of business interests.

Old Growth Forests

We received as many definitions of old growth forests as there were respondents to this question. Some specified an age which trees in a forest must attain to be classified as old growth, while others maintained that this age would vary depending on the tree species in question. Lack of human disturbance characterized some respondent's definitions of old growth and others stated that a host of ecological and structural features of forests define the term. Still others replied that there is no agreement on any one definition and the answer will vary depending on whom you ask.

There seemed to be greater consensus when respondents were asked if old growth was being cut for paper use. The majority of contributors believe that old growth is being cut for this purpose and some even provided a specific percentage of total harvest that is derived from old growth trees. Old growth boreal forests in Canada and Russia were mentioned repeatedly as specific locations where harvesting is occurring. Other responses include those from the paper industry commenting specifically on their organization's policies, emphasizing little or no use of old growth fiber sources.

To Cut Or Not To Cut

All respondents agree that some cutting of trees is necessary to supply human needs for wood products. Many, however, identify some exceptions and qualifications to this assertion, emphasizing the need to manage forests sustainably in order to provide for demand. One respondent advocates no logging on National Forest lands, suggesting that they provide more social and economic values when standing.

When asked if trees should be cut for papermaking, most respondents again replied affirmatively. They maintain that compared to trees, nonwood fibers require greater chemical application, generate increased runoff, and provide less wildlife habitat. These respondents advocate that trees are the most environmentally-friendly fiber source for papermaking, and should therefore remain the dominant source in paper. Others emphasize that utilization of nonwood alternatives, specifically agricultural fibers, might help relieve pressure on forests and provide benefits to farmers. Another respondent indicates that nonwood fibers are best, but if they cannot be used effectively in heavily forested areas, FSC-certified tree pulp should be used as a fiber source. (For more information on nonwood fiber alternatives, refer to the 'Tree Free Paper Issues' section of the Listening Study.)

Purchaser Verification

When asked how a purchaser could verify that a paper is the end product of a sustainably managed harvest, most respondents agreed that looking for a label which specifies a particular certification scheme is the most effective means. Most respondents indicated a preference for Forest Stewardship Council (FSC) certification and labeling. They maintain that products bearing the FSC logo have been tracked from a certified source using Chain-of-Custody documentation, the link between consumer preference and responsible, on the ground performance. The other labeling standard identified is the Sustainable Forestry Initiative (SFI). The SFI label is only used on products containing fiber materials that a qualified independent third party has certified to be in conformance with the SFI standard.

Genetically Engineered Trees

Most respondents expressed either uncertainty or were opposed to the use of genetically engineered trees for papermaking. Representatives from the paper industry emphasized that more research must be done

before any commercial application begins, but expressed an interest in this technology due to the growing demand for paper products. Respondents who oppose genetically engineered trees expressed their concern with the possibility of cross-pollination between native forest trees and genetically engineered trees and with federal regulation of this type of technology. One respondent replied favorably to the use of genetically engineered trees for papermaking, citing greater disease resistance and less need for fertilizers.

Plantations

A majority of respondents indicated that tree plantations can be a viable alternative to natural forests for pulp supply. Respondents cite several benefits of plantations, including reduced harvest pressure on natural forests, increased yield from less acreage in less time, and greater economic opportunity. In many cases, these same respondents also indicate that plantations must be well-managed and established on degraded lands, rather than natural forestland.

The concerns of a few respondents preclude their support of tree plantations supplying pulp for the paper industry. They maintain that plantations require extensive use of herbicides, and compared with natural forests, exhibit decreased soil productivity and species diversity. One respondent sums up the general tone of responses by stating, "They (tree plantations) could be in theory, but I haven't heard of an ecologically-sustainable one in practice."

Towards the Future

Based on the number of responses we gathered, sustainable forest management, both in theory and in practice, seems to be a concept that many people are attempting to define. The public is increasingly interested in the origin of the fiber sources that comprise the paper they purchase. Certification has arisen as a method to verify that forests, the primary source of tree fibers for paper, are sustainably managed. It is apparent when reading the answers to several of the Listening Study questions that there is disagreement as to which of the many certification schemes provides the best assurance that forests are being managed sustainably. Nevertheless, certification seems to be favored by many in the wood products industry and will likely gain greater popularity into the future.

If the demand for tree fibers to supply the paper industry continues to increase, tree plantations may be considered a reliable source for pulp supply. According to Listening Study respondents, whether plantations can be an ecologically acceptable alternative to natural forests and whether they can be the sole source of tree fiber for the global papermaking industry is still in question.

It is possible that our reliance on tree fibers for pulp supply may lessen as we explore alternative fiber sources such as kenaf, cotton, and hemp. The argument for tree-free fibers as an environmentally preferable alternative to tree fibers is contentious and many respondents seem to indicate that a combination of both might be the best solution to satisfy our growing demand for paper. For more information on alternative fibers visit the 'Tree Free Paper Issues' section of the Paper Listening Study online at http://www.paperlisteningstudy.org/tree.html.

It is likely that additional research into genetically engineered trees will yield more opinions as to whether this technology is appropriate for papermaking. If alternative fibers are used as a supplement to certified tree fibers, the latter coming from natural forests or well-managed plantations, it is possible that genetically engineered trees might not be necessary to supply the paper industry. Regardless, it is certain that additional research into this technology will continue.

LISTENING STUDY Question 55: How do you define sustainable forest management?

LISTENING STUDY: First, Maureen Smith provides one framing to show why sustainable forest management is even a question.

[There] is a fundamental dichotomy in the ways in which the subjects of forests and timber have come to be viewed. The modern business of cutting down trees cannot be unequivocally described as either a renewable *agricultural* industry or as an *extractive* industry (like mining or oil production) where the original resource is not considered renewable. As historically and currently practiced, timber production has characteristics of both. In essential respects the distinction between the two is well described by the difference (as the saying goes) between the forest and the trees. At one extreme, for example, the large-scale clear-cutting of old-growth and other late successional forests is clearly an essentially irreversible extractive process. No one has proposed that we can deliberately recreate them in all their complexity once they are gone, and the time scales of natural regeneration to a mature forest ecosystem are in any case measured in centuries. The process of natural regeneration further implies an absence or subtlety of human presence over such significant periods of time that its prospects are difficult to entertain for the future.

At the same time . . . although plantations have much in common with conventional agricultural crops, they have very little – except trees – in common with forests. . . .

The traditional practice of timber production in the United States, often referred to as *timber mining*, has been slowly and unevenly transitioning to the practice of *sustainable timber production* or *sustainable yield* in recent decades. . . . More lately these concepts have begun to give way to new attempts to define *sustainable forest management*. . . .

— Maureen Smith 1997

LISTENING STUDY: Some responses, including unified comments from representatives of the paper industry, reference sustained yield concepts.

Sustainable forestry can be defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic that integrates the reforestation, managing, growing, nurturing and harvesting of trees for useful products with the conservation of soil, air and water quality, biological diversity, wildlife and aquatic habitat, recreation and aesthetics.

— American Forest and Paper Association
www.afandpa.org/Content/NavigationMenu/Environment_and_Recycling/Recycling/Recycling_Resources/Recycling_Glossary.htm

Sustainable forest management can be defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic that integrates the reforestation, managing, growing, nurturing and harvesting of trees for useful products with the conservation of soil, air and water quality, biological diversity, wildlife and aquatic habitat, recreation and aesthetics. — Stora Enso

A sustainable forest is one that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable forestry is the practice of a land stewardship ethic that integrates reforestation, managing, growing, nurturing and harvesting of trees for useful products with the conservation of soil, air and water quality, biological diversity, wildlife and aquatic habitat, recreation and aesthetics. — International Paper

Sustainable forest management: forest management that produces goods for the present without compromising the productive capability and biological integrity on which future generations will depend. — Northern Forest Alliance 1999

Principles of Sustainability:
a) maintenance of soil productivity,

b) conservation of water quality, wetlands, and riparian zones,
c) maintenance or creation of a healthy balance of forest age classes,
d) continuous flow of timber, pulpwood, and other forest products,
e) improvement of the overall quality of the timber resource as a foundation for more value-added opportunities,
f) addressing scenic quality by limiting adverse aesthetic impacts of forest harvesting, particularly in high elevation areas and vistas,
g) conservation and enhancement of habitats that support a full range of native flora and fauna,
h) protection of unique or fragile natural areas,
i) continuation of opportunities for traditional recreation.

Sustainable forestry: Forest management practices for which the outcome will be sustained yield.
— Northern Forest Lands Council 1994

LISTENING STUDY: Other responses highlight ecological integrity when defining sustainable forest management.

Sustainable forest management can be defined as active forest stewardship that meets human needs without compromising the ecological integrity of forest ecosystems. — Michael Snyder, Forester

To manage forests in a way that maintains their natural value. Any extraction of resources and any intrusions of roads can be harmful. Cautious approaches to determine the ecological impacts of any intrusion or extraction should be assessed. — Frank Locantore, Co-op America

Sustainable forest management: management regimes applied to forestland that maintain the productive and renewal capacities as well as the genetic, species and ecological diversity of forest ecosystems. — United States Forest Service, www.fs.fed.us/r6/fremont/sycan/text/APPENDIX_C.htm

In a nutshell, the Silva Forest Foundation defines sustainable forest management as that which maintains ecological integrity at all spatial and temporal scales. We have defined sustainable forest management through our standards developed for obtaining accredited certifier status under the Forest Stewardship Council. Documents can be found on our web site: www.silvafor.org. — Susan Hammond, Executive Director, Silva Forest Foundation

Sustainable forest management means protecting *all* values of the forest -- not just timber production, but also water quality, wildlife habitat, preservation of natural forest ecosystems and conservation of biodiversity. — Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

LISTENING STUDY: Many responses include social, economic, and ecological components.

Sustainable forest management is the process of managing a forest to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment. — International Tropical Timber Organization, www.itto.or.jp/live/PageDisplayHandler?pageId=13

Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. These needs are for forest products and services, such as wood and wood products, water, food, fodder, medicine, fuel, shelter, employment, recreation, habitats for wildlife, landscape diversity, carbon sinks and reservoirs, and for other forest products. Appropriate measures should be taken to protect forests against harmful effects of pollution, including air-borne pollution, fires, pests and diseases, in order to maintain their full multiple value.
— United Nations General Assembly 1992

Sustainable forest management is management that maintains and enhances the long-term health of forest ecosystems for the benefit of all living things while providing environmental, economic, social and

cultural opportunities for present and future generations. — Natural Resources Canada, www.nrcan.gc.ca/cfs-scf/science/prodserv/glossary_e.html

Forest Management deals with the overall administrative, economic, legal, social, technical and scientific aspects related to natural and planted forests. It implies various degrees of deliberate human intervention, ranging from actions aimed at safeguarding and maintaining the forest ecosystem and its functions, to favoring specific socially or economically valuable species or groups of species for the improved production of goods and services. Sustainable forest management will ensure that the values derived from the forest meet present-day needs while at the same time ensuring their continued availability and contribution to long-term development needs.
— Food and Agriculture Organization of the United Nations 1993

National-level criteria of sustainable forest management focus on the following globally agreed elements: extent of forest resources; biological diversity; forest health and vitality; productive functions of forests; protective functions of forests; socio-economic benefits and needs; legal, policy and institutional framework. The indicators vary widely among initiatives owing to differences in forest types and environmental, social, political and cultural conditions.
— Food and Agriculture Organization of the United Nations 2000

Sustainable forest management (sustainable forestry): the stewardship and use of forests and forestlands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality, and potential to fulfill, now and in the future, relevant ecological, economic, and social functions at local, national, and global levels, and that does not cause damage to other ecosystems. — Ministerial Conference on the Protection of Forests in Europe 1993

Criteria for sustainable forestry include:
(a) conservation of biological diversity,
(b) maintenance of productive capacity of forest ecosystems,
(c) maintenance of forest ecosystem health and vitality,
(d) conservation and maintenance of soil and water resources,
(e) maintenance of forest contributions to global carbon cycles,
(f) maintenance and enhancement of long-term, multiple socioeconomic benefits to meet the needs of societies, and
(g) a legal, institutional, and economic framework for forest conservation and sustainable management.
— Montreal Process 1995

I define "sustainable forestry" as:

a) management, protection, and restoration that maintains natural forest ecosystems, remaining wild areas, clean water, abundant and well-distributed populations of all native species, other biological components and ecosystem processes of natural forests, long-term productivity for timber and non-timber forest products, and other ecosystem services, while

b) allowing for forest resource extraction and development that is compatible with (a), and while

c) promoting social equity, including among present and future generations, and amongst different economic beneficiaries.

In the U.S., wood and paper companies, as well as some non-industrial forest landowners and state trust lands, need to generate economic returns from their forests. Even the most “balanced” commercial forest management is unlikely to fully sustain all forest values, including wilderness, or species which need extensive intact and mature forests. However, we can --
and must -- move towards much greater sustainability on private and other non-federal forests in the U.S.

Thus I define "well-managed forests" as forests where resource protection, restoration, and management is as sustainable as possible, relative to my definition of “sustainable forestry,” given: a) ecological, social, and economic contexts for the forest in question, and b) opportunities for using more sustainable forest management practices. In the U.S., the social and economic context for forestry differs most significantly amongst land ownership types. For example, the public expects National Forests and other federal public lands to be managed in the public interest, and along with forest products, to provide old growth ecosystems, wilderness, and other values that are less realistic to expect from private ownerships. — Daniel Hall, Forest Biodiversity Program Director, American Lands Alliance

Sustainable forest management maintains native biodiversity and natural processes of the forest ecosystem, is financially feasible for the landowner, and is socially acceptable. — Robert R. Bryan, Forest Ecologist, Maine Audubon

There is nothing better about old trees than young trees. Perhaps the ideal state is to have forests of all ages – young, medium and old – across the landscape. This will provide the highest diversity of habitats and therefore an opportunity for the largest number of species to live in that landscape. — Transcript from ***Trees Are the Answer***, video hosted by Dr. Patrick Moore, Green Spirit, 2001

LISTENING STUDY: Maureen Smith again, suggesting that assuring sustainability in our forests, especially if we mix in economic aspects, is not so simple as we might wish.

Although the value of timber as a commodity can be measured, forests cannot be similarly deconstructed into simple economic terms despite the best efforts of diligent resource economists. Increasingly in recent years, there have been theoretical attempts to quantify present and future values of forest biodiversity, the value of (poorly understood) "ecosystem services" such as climate and watershed regulation, as well as the amenity (recreational) and even religious and cultural values of forests. Not surprisingly, such attempts have failed to do more than suggest the vast dimensions of our ignorance. . . .

The debates over forests and timber and over associated public and industry policies have . . . to be understood to turn largely on whether one views (or at least portrays) the modern business of timber production as an extractive industry or as a renewable industry. One can quickly turn, for example, from a literature of heartbreaking images and vehement denunciations of the rape of the forests to mainstream forest industry publications that cheerfully announce "we're planting faster than we're cutting." The problem is that what they have been planting often bears only a trivial relationship to what they have eliminated. The jargon of agriculture, with its overtones of cyclical renewability, is pervasive in discussions of timber resources. . . . This masks, however, what has substantially been and continues to be an unrenewable, essentially extractive process of destruction – at best a simplification and shallow mimicry of the structural, functional, and genetic diversity of healthy forest ecosystems.
— Maureen Smith 1997

LISTENING STUDY Question 56: Are there acceptable methods to verify that a forest is sustainably managed?

A number of third-party certification programs exist to verify forest management methods. In the United States, standards for forest management include the American Forest & Paper Association's Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC). At present, FSC is more broadly accepted among environmental groups, while SFI is evolving in ways that may improve its acceptance among those groups. — Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

LISTENING STUDY: Some responses reference the Sustainable Forestry Initiative (SFI) as a credible way to verify sustainability.

In addition to its participation in the Sustainable Forestry Initiative (SFI), Boise expanded its forest stewardship program in 1999 to include an additional, comprehensive set of forest management objectives entitled Boise Forest Stewardship Values and Measures. Boise incorporates compliance with the Forest Stewardship Values and Measures and SFI standards into all of our forest management plans and programs. Boise retained PricewaterhouseCoopers LLP, an internationally known business services firm, to provide a series of third-party forest management audits assessing Boise's implementation of and compliance with SFI and our own standards. Boise's certification program has two unique features. First, our customers are invited to accompany the independent audit teams into the forests to observe their work. Second, Boise has also established a Forest Stewardship Advisory Council of nationally known conservation experts who participate with Boise foresters in reviewing audit results and recommending changes. — Boise Cascade, www.bc.com/environment/index.html

The Natural Resources Council of Maine is working to promote voluntary, third party forest audits that will ensure Maine's forests are managed so that they protect the timber supply, ecological health of the forest and economic health of our communities. The independent Forest Stewardship Council in the ONLY audit and certification program currently available that the public can trust. The industry-controlled alternative is like letting the fox guard the chicken coop.
— The Natural Resources Council of Maine,
http://www.maineenvironment.org/WoodProducts/FSCfactsheet.htm

Third party certification of a recognized sustainability standard such as the Sustainable Forestry Initiative (SFI) is a good way to verify sustainable forests and harvests. — International Paper

Georgia Pacific's Wood and Fiber Procurement Environmental Strategy addresses several key areas including harvesting practices, wildlife habitat, private landowner leadership, public land management and facility management. Georgia-Pacific foresters demonstrate Sustainable Forestry in Action through third-party verification of wood procurement practices under the Sustainable Forestry Initiative (SFI).
— Georgia Pacific, www.gp.com/forestry/sustain.html

LISTENING STUDY: Other responses indicate that the Forest Stewardship Council (FSC) provides a reliable method of verifying sustainability.

Basic monitoring of forest resource conditions can be used to determine whether forests are managed per my definition of "sustainable forestry.

Currently, the best system for determining if commercial forests are "well-managed" is the independent certification system of the Forest Stewardship Council (FSC). The FSC is the only forest certification system in the US that:

- Is governed at all levels by an equal balance of environmental, social, and economic interests.
- Is consistently and sufficiently independent from the companies being certified.
- Has a primary emphasis on performance standards for “on-the-ground” outcomes, vs. open-ended “system-based” standards.
- Explicitly addresses a broad range of environmental, social, and economic concerns.
- Prohibits conversion of natural forests to ecologically-impoverished plantations.

— Requires protection measures for old growth forests.
— Requires management for other natural forest attributes and ecosystem function at meaningful levels.
— Requires consistent chain-of-custody monitoring system to track certified products from the forest to point of sale.
— Daniel Hall, Forest Biodiversity Program Director, American Lands Alliance

The Forest Stewardship Council (FSC) is a scheme which issues certificates for well-managed forests and was created to provide the means for corporate buyers and the public to identify products coming from responsible forest management, with the aim to create the economic incentives for wider application in the market place.

Ecologically responsible forest management such as that required by the FSC, seeks to ensure that the ecosystem of the forest is not damaged and only low volumes of trees are extracted. The impacts on the plant and animal life in the forest from this method of logging are minimal. Greenpeace is a founding member of the FSC and is active in its development at both the international, national and regional levels. — Greenpeace**,** http://archive.greenpeace.org/forests/forests_new/html/content/sol_fsc.html

Certification systems that verify management to the above (sustainable forest management) definition. So far only the Forest Stewardship Council (FSC) meets all three parts of the definition. — Robert R. Bryan, Forest Ecologist, Maine Audubon

We consider Silva Forest Foundation's certification standards to be acceptable, as well as some national and regional standards developed under the Forest Stewardship Council system.
— Susan Hammond, Executive Director, Silva Forest Foundation

Logging destroys forests when practices such as clearcutting large areas, removing too many large or old trees, building roads, and polluting streams damage a forest ecosystem to the point where it can no longer regenerate itself. But the use of sustainable forestry practices can ensure that an ecosystem remains intact and can be logged periodically for years to come. The Forest Stewardship Council (FSC) uses input from environmental, science, and business interests to determine sustainable logging practices for different forest areas based on each ecosystem's characteristics.

The FSC system sets rigorous standards based on environmental, social, and economic criteria, and independent third-party auditors evaluate forests based on these standards. Products that come from forests that receive FSC certification are allowed to bear the FSC symbol so that consumers can identify the products as having come from well-managed forests. You can show your support for sustainable forestry practices by purchasing items – from furniture to musical instruments – that bear the FSC logo. — Co-op America 2001

The Forest Stewardship Council (FSC) process is necessary but not sufficient. — Frank Locantore, Co-op America

LISTENING STUDY: Other responses do not reference a specific standard or scheme.

Criteria and indicators provide a means to measure, assess, monitor and demonstrate progress towards achieving sustainability of forest management in a given country or in a specified forest area over a period of time. Certification, on the other hand, is an instrument used to confirm the achievement of certain predefined minimum standards of forest management in a given forest area at a given point in time.

One way of demonstrating that a particular forest is being managed sustainably for wood production purposes is through the act of third-party certification. A number of international, regional and national forest certification schemes now exist. — Food and Agriculture Organization of the United Nations 2000

Third party certification to a credible forest certification standard can be a tool to verify that a forest is sustainably managed. — Stora Enso

Yes, but they vary with those doing the "accepting." Moreover, given how much is not known about ecological integrity, verification methods must be conservative. — Michael Snyder, Forester

LISTENING STUDY: Some researchers are studying and comparing the effects of different certification schemes.

UPM Plans Forest Certification Field Tests: UPM has announced it will begin parallel certification field testing of forest certification schemes in three different countries this summer: Finland, the U.K. and Canada. Testing will be done on company owned and managed land between national schemes and international PEFC and FSC schemes. WWF International will act as an observer in the project.

The results of the test will open an opportunity to improve different national certification standards and to get them accepted by a broad base of stakeholders. With this initiative, UPM wants to promote the increase of certified fibre globally. Based on these test results, UPM will further develop its worldwide forestry and wood sourcing practices and promote the development of credible certification schemes in the countries it operates.

"Through parallel certification field testing we can evaluate the benefits of different schemes," says Jaakko Sarantola, senior vice president, Forestry and Wood Sourcing. "At the moment there is strong competition between the schemes and this has caused confusion in the international market. Testing will tell of our willingness for continuous improvement and at the same time will provide an opportunity to compare the different schemes equally."

"WWF welcomes this initiative. Together with the recently announced other ongoing assessments of certification systems at national level in Europe, the results of this test will form a solid basis for defining thresholds for credible certification which are understandable by all stakeholders in the certification debate. We are particularly keen on this initiative, which will allow us to learn and develop the certification processes further," says Duncan Pollard, the Head of the European Forest programme at WWF International.

In Finland and the U.K., the testing will be carried out on company owned land, which is currently certified to national forest standards (FFCS and UKWAS). In Canada, the testing will be carried out on provincially owned forests managed by the company. The Canadian forests are certified according to the North American SFI scheme. In all countries the comparisons will be made with PEFC and FSC, and in Finland with both the Swedish FSC and draft Finnish FSC.

There are currently more than 50 different certification schemes worldwide, but only less than 5% of world's forest resources are certified. UPM is committed to several national and international certification schemes through its own guidelines. UPM strongly supports the mutual recognition of forest certification schemes that have comparable standards for sustainable forest management. UPM sees that forest certification is one tool to confirm that the fibre used in its products comes from well and sustainably managed forests.

— UPM press release, reported on Paperloop.com, June 23, 2004

LISTENING STUDY Question 57: Are there enough forestlands meeting an acceptable definition of "sustainably-managed" to supply the paper industry?

At present, there are not enough FSC-certified forestlands to meet demand in the U.S.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

LISTENING STUDY: Some responses indicate that there are enough "sustainably-managed" forestlands to supply the paper industry.

There can be some confidence that there will be sufficient fibre to meet current projections for growing global paper consumption into the next century, even if the remaining opportunities for the one-off mining of natural forests are closed off. But paper is likely to be more costly, and consumption growth will only be met through an acceptance of pulp derived from well-managed plantations in developing countries.

As a result, it appears that much of the current concern that fibre inputs will be the principal limiting factor on global consumption growth is not borne out. Instead, the capacity of the environment to deal with the outputs of the paper cycle could form the limiting factor. At a national or regional level, however, as the India case study demonstrated, fibre shortfalls could continue to hold back consumption, and could indeed worsen. Trade liberalisation and a resolution of the stand-off over new pulpwood plantations could resolve some of these local constraints. — Robins 1996

Yes, but it ultimately depends on where the manufacturing facility is located. There are enough certified lands in North America, Europe, and now much of Latin America to meet the demand for paper. However, there are probably not enough certified lands in Asia and Eastern Russia to meet demand in those areas today. — International Paper

Yes. Stora Enso North America's wood procurement system is certified to the Sustainable Forestry Initiative (SFI[SM]). There are requirements with this certification to ensure that all the wood Stora Enso North America uses come from sustainably managed forests. Many forests are managed sustainably but are not certified. Examples of these forests are public lands where there is no legislation to meet sustainability requirements. — Stora Enso

LISTENING STUDY: Other responses convey a shortage of "sustainably-managed" forestlands supplying the paper industry.

Thus, the Taiga Rescue Network, which monitors forest conservation in boreal areas, has concluded: if paper consumption in the affluent countries is allowed to grow, we will very soon reach the limits of ecologically sustainable timber harvest on a global scale.
— Taiga Rescue Network, www.iied.org/smg/pubs/rethink3.html

Even though consumption forecasts for paper and board are steadily growing at an average rate of 2% per year, even with improved technology, a higher recycling rate and more efficiency, the need for wood (in European markets) will also increase. When looking at the three developments (increased use of biomass for energy production, enhanced carbon sequestration via forest management measures, closer to nature forest management) which could threaten its mobility, the industry could face a lack of wood as raw material in the years to come because it cannot be supplied efficiently. — De Galembert 2003

No. — Susan Hammond, Executive Director, Silva Forest Foundation

LISTENING STUDY: Another response indicates that the question is unanswerable due to the inconsistencies inherent in defining "sustainably-managed" forestlands.

This is impossible to answer because many lands have not been certified, and some systems, i.e. Sustainable Forestry Initiative (SFI) and Tree Farm, do not fully address the definition. Some of the SFI and Tree Farm lands may meet the definition, but that cannot be determined from the certification.
— Robert R. Bryan, Forest Ecologist, Maine Audubon

LISTENING STUDY Question 58: What are "old growth forests"?

"Old growth" describes the fourth and final stage of stand development, following mature forest, in which the forest canopy is generally composed of scattered remaining trees that assumed dominance following natural disturbance along with newly dominant, shade-tolerant trees. Other characteristics of oldgrowth forests may include accumulated coarse woody debris, snags and canopy gaps created by fallen trees. Because of these features, and the presence of an understory, old-growth forests generally exhibit complex stand vegetation, and provide habitat for many species. Development of old-growth forest generally takes from 100 to 200 years, with variation depending on forest type. The last remaining sizable area of old-growth forest in the contiguous United States lies in the Pacific Northwest; only a few small and isolated patches of old-growth remain in eastern forests. However, as a stage in stand development, old-growth forest could also develop in eastern forests (and was present in presettlement forests). — Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

LISTENING STUDY: Some responses reference a specific age which trees in a forest must attain to qualify as "old growth."

1. A forest stand usually at least 180-220 years old with moderate to high canopy closure
2. A multilayered, multispecies canopy dominated by large overstory trees
3. High incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence)
4. Numerous large snags, and heavy accumulations of wood, including large logs on the ground

— Bureau of Land Management, www.reo.gov/library/reports/old_growth_definitions.htm

Old growth forest: an undisturbed forest with trees that are more than 200 years old. It is characterized by fallen trees, trees with broken tops, and mature and dying trees. — U.S. Fish and Wildlife Service, http://training.fws.gov/deo/endang/gloss.html

Old growth forests enrich our biodiversity and provide core habitat for wildlife, they serve as genetic repositories for future crop trees and they yield non-timber products such as medicinals. And for many people old growth forests provide unparalleled spiritual, aesthetic and recreational values.

Old growth comprises a set of forest conditions that should not be described by the age class of trees alone. For example, in the northeast, mature hardwood trees of 80-120 years of age can satisfy many values that are ascribed to old-growth forests even though they are still vigorously growing.

— Eric Palola, National Wildlife Federation, in testimony to the Senate Subcommittee on Forests and Public Land Management, October 2, 2001

The fourth and final stage of stand development, following mature forest, in which the forest canopy is generally composed of scattered remaining trees that assumed dominance following natural disturbance along with newly dominant, shade-tolerant trees. Other characteristics of old-growth forest may include accumulated coarse woody debris, snags and canopy gaps created by fallen trees. Because of these features, and the presence of an understory, old-growth forests generally exhibit complex stand vegetation, and provide habitat for many species. Development of old-growth forest generally takes from 100 to 200 years, with variation depending on forest type. The last remaining sizable area of old-growth forest in the contiguous U.S. lies in the Pacific Northwest; only a few small and isolated patches of old-growth remain in eastern forests. However, as a stage in stand development, old-growth forest could also develop in eastern forests (and was present in presettlement forests). — Environmental Defense, www.environmentaldefense.org/documents/1625_GLOS4-11.pdf

LISTENING STUDY: Other responses indicate that age is an important characteristic of "old growth forests" but emphasize that this varies with the individual tree species in question.

I suppose it varies by observer. I'd be comfortable with a definition of old-growth that included something about a fully functioning forest with trees exceeding 50% of maximum age for each species.

— Michael Snyder, Forester

Old growth forests are those where the average age of dominant canopy trees exceeds half the mean pathological age of the species, as well as those that have not had significant human intervention (some light cutting or road building might be acceptable). — Robert R. Bryan, Forest Ecologist, Maine Audubon

An old-growth forest is a forest ecosystem where the dominant trees largely exceed the biological maturity age of the species concerned taking into account its specific environment and its geographical location. The temporal dynamic of these forests is characterised by the coexistence of living trees, senescent trees and standing dead trees as well as the presence of fallen dead trees, lying on the ground, showing different decomposition levels. Those forests show little or no evidence of human disturbance.
— Canadian Forest Service, www.storaenso.com/CDAvgn/showDocument/0,,1003,00.pdf

Old growth forests must be defined for each forest type, such as temperate rain forest, boreal forest, tropical rain forest, and any other major forest type. Scientists are now recognizing that within these broad forest types, there is enormous variability and that further definition is required. The definition of old growth in any kind of forest is constantly evolving as scientists get a clearer understanding of the many variables that make up any forest system. There is an excellent publication that describes the challenges in defining old growth. It's called "New Findings about Old-Growth Forests," and is a Science Update from the Pacific Northwest Research Station (Issue 4, June 2003).
— Susan Hammond, Executive Director, Silva Forest Foundation

LISTENING STUDY: Some responses reference lack of human disturbance as a qualifying characteristic of "old growth."

Greenpeace supports the Taiga Rescue Network (TRN) definition, whereby the term old-growth forest can be applied to an area in which no forestry activities have been conducted since 1960, if the area in question measures at least ten hectares and contains at least ten cubic meters per hectare of the decomposing wood that is so vital to many animal species. It is almost impossible to find any dead trees in planted forest areas. — Oliver Salge 2003

Forests in the last stage of successional development after a long period without significant disturbance. They are generally characterized by multiple canopy layers, variety in tree sizes and species, decadent old trees, standing and dead woody material, and abundant ground-level decomposition. — Northern Forest Alliance 1999

Forest that is ecologically mature and has been subjected to negligible unnatural disturbance such as logging, mining, roading and clearing. The definition focuses on structural diversity and includes forest in which the upper stratum or overstorey is in the mature and late mature stage, and regrowth more than 120 years old produced through natural processes, ie. Wildfire or windstorm. — Native Forest Network, www.nfn.org.au/climfor/cf13.html

Perhaps the only definition of old growth that works in the context of papermaking is: Forests that have not been extensively disturbed by industrial logging in the past 150 years.
— Susan Hammond, Executive Director, Silva Forest Foundation

LISTENING STUDY: Some responses reference various ecological and structural features of forests that would indicate their status as "old growth."

A community with dominant trees at or near biological maturity. The age and structure of an old-growth community varies with species and site. Old-growth stands are sometimes characterized by a multi-layered, uneven age and size class structure; a high degree of compositional and structural patchiness and heterogeneity; and significant amounts of woody debris and tip-up mounds. — United States Forest Service, www.fs.fed.us/r9/cnnf/cnnf-old/nf_plng/alt_glossary.htm

Old growth is best identified by certain features of the forest. These features include increased size of trees, large standing dead trees, fallen trees, buried wood in various states of decay, thick forest floor, tree

lichens and a high diversity of fungi, etc. These features all contribute to a more complicated forest structure than the earlier successional stages of the forest, and this results in a higher diversity of plants and animals. — Rainforest Action Network, www.ran.org/ran_campaigns/old_growth/smartpaper/Smart_Paper_2004.pdf

Old-growth forest—forests that contain a wide range of tree sizes and ages, and often including a long-lived dominant and a shade-intolerant associate, a deep, multilayered crown canopy, large individual trees, and significant accumulations of coarse woody debris including snags and fallen logs. — Society of American Foresters 1991

Old-growth forests are the fourth and final stage of stand development, following mature forests, in which the forest canopy is generally composed of scattered remaining trees that assumed dominance following natural disturbance along with newly dominant, shade-tolerant trees. Development of an old-growth forest generally takes more than 100 years, with variation depending on forest type. An old-growth forest exhibits these characteristics:

- A watershed-level forest of 5,000 acres or more in size, that has been left undisturbed, and predominantly has trees that are 200 to 1,000 years old;
- The accumulation of coarse woody debris, snags, and canopy gaps created by fallen trees;
- The presence of an understory consisting of a multilayered combination of seedlings, mature trees, bushes, and other plants, which attribute to a complex stand vegetation pattern;
- The inclusion of numerous dead trees, both standing and fallen, that provide essential habitat and nutrients to plant and animal forest species;
- An ecosystem rich in biodiversity, providing habitat for a wide variety of indigenous plant and animal species.

— Boise Cascade, www.bc.com/environment/index.html

Although the ages of some [Canadian] boreal larch and black spruce trees have been found to exceed 350 years, the unifying feature of Canada's boreal's old-growth is generally not age *per se* . . . but the set of structural characteristics shared by many forest types in the later stages of succession. Relative to younger stages, old stands have trees of many ages and sizes and often have more large canopy trees, large snags, and large downed logs. Overall, structural diversity is highest in old stands, and this is reflected in unique plant and animal communities as well as high overall species richness relative to younger stands. — Bringing Down the Boreal, ForestEthics, 2004

LISTENING STUDY: Other responses indicate that there are many definitions of "old growth forests" but little agreement on any one particular definition.

The US Forest Service has over 100 definitions for "old growth." The definition changes depending on whom you ask. The "old growth" issue was raised largely as a result of the harvesting of 1000-year-old huge towering Douglas fir trees in the rainforests of the Pacific Northwest. Visions of these majestic and relatively rare trees being harvested for wood products caused a public outcry. Today, activists are calling 100-year-old trees of interior Canada "old growth" even though the trees are 1/8 the size of the Pacific Northwest "old growth" trees and are not endangered from a biodiversity perspective. A more scientific and precise term that Conservation International uses when characterizing endangered woodlands is "forests of exceptional conservation value," or FECV for short. — International Paper

Addressing the issue of "old growth" is a challenge, given the lack of consensus on a definition for the term: researchers at the U.S. Forest Service found at least 114 definitions. "Old growth" describes not only the age of the trees, but the overall state and composition of a forest as well.
Governmental authorities, environmental organizations and businesses worldwide share the goal of protecting ecologically rich ancient forests. Exchanging information through dialogue and scientific reporting helps to develop forest management approaches designed to conserve the biodiversity and cultural values of old growth forests. — Stora Enso

LISTENING STUDY: Other responses:

There are 100-some definitions out there, but mainly it just means that older trees are dominant in a landscape. — Partin 2004

Forests that have been able to evolve for centuries and maintain their ecological integrity.
— Frank Locantore, Co-op America

LISTENING STUDY Question 59: Are old growth forests being cut for paper use?

LISTENING STUDY: Some responses indicate that old growth forests are being cut for paper use.

Yes. — Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Old growth forests make up 16% of the virgin tree fiber used each year to make paper products. — Abramovitz 1999

According to the International Institute for Environment and Development (IIED), old growth forests remain a significant source of fibre in boreal regions, accounting for 15 percent of total global pulpwood. — Senate Subcommittee on the Boreal Forest, Competing Realities: The Boreal Forest at Risk, Report of the Sub-committee on Boreal Forest of the Standing Senate Committee on Agriculture and Forestry, 1999. <www.parl.gc.ca/36/1/parlbus/commbus/senate/com-e/bore-e/rep-e/rep09jun99-e.htm <http://www.parl.gc.ca/36/1/parlbus/commbus/senate/com-e/bore-e/rep-e/rep09jun99-e.htm>

The bulk of ancient forest pulp and paper in the world is produced in Canada. Wood Resources International estimated that in 1993, at least 70% of the raw material processed by the Canadian paper industry came from ancient forests. Much of this ends up as graphic paper and newsprint, consumed in the United States. Russian paper plants rely on ancient forests for 76% of their pulp. — Greenpeace, www.greenpeaceusa.org/media/publications/forests/Resource3.pdf

The United States paper industry is structured almost entirely around wood as the source of fiber. This has resulted in the decimation of our old growth forests. Even today, old growth forests continue to be clearcut to make paper. — New Leaf Paper, www.newleafpaper.com/ecopaper.html#a

Yes, particularly in Canada's boreal forest. — Susan Hammond, Executive Director, Silva Forest Foundation

For every ton of paper produced, two to four tons of trees are brought to the mill, with old growth trees supplying nine percent of that fiber. — Resource Conservation Alliance, ***Focus on Paper Consumption***

It is hard to imagine a poorer use of our natural resources than to have ancient and endangered forests being logged to make disposable paper products. We have already lost 95% of our old growth forests in the US and worldwide nearly 80% have been destroyed or degraded. But ancient forests, like the boreal forests of Canada, and endangered forests, like the native hardwood forests of the southern US, are still being logged and made into paper every day.
— The Paper Campaign, www.thepapercampaign.com/about.html

Many logging companies over-harvest and target late seral or "old-growth" forests at levels that are not sustainable. . . . Forestry companies preferentially select the oldest stands for harvest because these stands have the greatest tree volume and are at risk of being lost to fire or insect damage. . . . Catalogs, copy paper, lumber, newspapers, magazines, and even toilet paper are made from Canada's old-growth forests. U.S. consumption accounts for about a million acres of clearcuts in the Canadian Boreal every year. — ***Bringing Down the Boreal***, ForestEthics, 2004

LISTENING STUDY: Other responses mention specific organizational policies regarding old growth forests and papermaking.

Boise currently derives an extremely small amount of our wood supply from old-growth forests - less than 1% in 2001. Most of this supply comes from federal lands. Given the direction of federal forest management policy, we expect that percentage to continue gradually to decline. We intend, therefore, to phase out harvesting from old-growth forests by 2004. During that time, we will meet our existing commitments, but we will not make any new commitments to harvest timber from old-growth forests.

A number of uncertainties make it impossible for Boise to guarantee that no old-growth fiber is used to make our wood and paper products. Wood waste from sawmills used in our papermaking

process occasionally may come from mature trees. When we purchase wood chips for papermaking from outside suppliers, we can never be sure about the exact age or size of the trees that the chips came from. — Boise Cascade, www.bc.com/environment/index.html

Our approach to managing old growth forests is guided by Stora Enso's Principles of Environmental and Social Responsibility for Wood Procurement and Sustainable Forest Management. Stora Enso North America does not purchase wood from protected areas or areas in the process of designation for protection, unless purchases are clearly in line with relevant conservation regulations and goals. When we harvest wood from areas with significant conservation value, we do so in line with official conservation plans. — Stora Enso

Answers will vary depending on whom you ask. The old growth issue has expanded to include endangered forests of all types of ages, species, and sizes. Endangered forests are being cut for paper today, but mostly in less developed countries than the U.S. International Paper does not cut old growth. — International Paper

LISTENING STUDY: Other responses:

Very few old-growth trees in the U.S. are harvested expressly for the purpose of making paper. The reason is that such trees are far more valuable for use in solid wood products, primarily lumber. Sawmill residues, a by-product of lumber production, are in some cases used to make paper, however. In fact, these residues are the primary source of material used to make paper in the western U.S., accounting for over two-thirds of the region's pulpwood production in 1991. — Paper Task Force 1995

Old growth forests are not being cut for paper use in the Northeastern United States. My understanding is that much of the wood harvested in boreal Canada is old growth. This wood makes up a large and growing segment of the U.S. market. — Robert R. Bryan, Forest Ecologist, Maine Audubon

LISTENING STUDY Question 60: Should we not cut any trees at all?

LISTENING STUDY: All responses indicate that some cutting of trees is necessary to supply human needs. One response states that logging should be done only on private lands while others suggest that non-wood fibers be used first as an alternative to tree fibers. Still others emphasize the importance of managing forests to provide a sustainable resource.

From a social and economic perspective, our National Forests are far more valuable standing, growing, dying, and regenerating where they are than cut down and converted into two by fours and paper products. National forests provide many social and economic contributions to the nation, simply by existing as natural ecosystems.
— National Forest Protection Alliance, www.forestadvocate.org/protect&restore/economics.htm

Could we? — Michael Snyder, Forester

In many cases trees are an important and effective source of fiber. — Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Wood is the most environmentally-friendly source of building materials and fiber available. Compared with other materials (steel, concrete, non-tree fibers), wood requires less energy, creates less pollution, and is recyclable and biodegradable. In a managed forest we can maintain almost all biodiversity values, while those dependent on old growth or wilderness can be maintained in special management areas (mostly public lands). — Robert R. Bryan, Forest Ecologist, Maine Audubon

We should cut and harvest trees sustainably to help protect the environment. Harvesting trees through sustainable forestry practices increases the use of greenhouse gas neutral materials, provides rural communities with valuable income, and supports a tremendous volume of recyclable consumer goods. In fact, if we were to stop cutting trees to make paper in America there would be opportunities for less developed countries to cut trees at an unsustainable pace and, for the large part, in an unsustainable manner. In addition, small non-industrial private landowners in the US would lose revenue generated from growing forests. Stopping the cutting of trees would actually create an incentive for landowners to sell their forestlands for development and permanently eliminate the forest. — International Paper

Humans need wood for a wide variety of purposes and will continue to cut trees. However, we may not need to cut trees for paper if we use non-tree fibres and recycled paper.
— Susan Hammond, Executive Director, Silva Forest Foundation

We should cut trees to supply needs that cannot be met with post-consumer or other fibers.
— Frank Locantore, Co-op America

Trees are a renewable resource and with sustainable forest management can provide us with the fiber we need for paper, building, fuel, and other uses. These sustainably managed forests also provide us with additional benefits such as enhanced wildlife habitat, increased forest vigor, recreation opportunities and forest fire prevention. — Stora Enso

There are those who argue that we should cut fewer trees and use less wood and that this would be good for the environment. A closer look at how we use wood and other resources reveals just the opposite – that we should be growing more trees and using more wood, not less. In particular, if we use less wood we will inevitably use more nonrenewable materials and fuels to build and maintain our civilization. . . .

Deforestation is a difficult subject for the forest industry because it certainly looks deforested when all the trees are cut down in a given area. But it's only deforested if the area is not reforested. . . . Deforestation means the permanent removal of the forest, the most common cause of which is clearing for agriculture and cities. . . .

Preventing the further loss of the world's forests has little to do with forestry and everything to do with managing our population, growing more food on less land, and ending urban sprawl. . . . A large parking lot is the ultimate in deforestation and the automobile is arguably the most destructive technology ever invented by the human species. . . .

— Transcript from ***Trees Are the Answer***, video hosted by Dr. Patrick Moore, Green Spirit, 2001

LISTENING STUDY Question 61: Should we not cut any trees at all for paper-making?

LISTENING STUDY: Most responses indicate that trees should be cut to make paper. Some responses reference the importance of exploring nonwood alternatives and/or using pulp from sustainably harvested trees. One response mentions that agricultural plants should replace trees as the dominant fiber source for papermaking.

After postconsumer recycled content, trees are an important and effective source of fiber for paper and paper products. — Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Before wood pulp became widely used in the late 1800s, agricultural plants were the dominant source of fiber. Cotton, straws, and hemp - the paper used to draft the Declaration of Independence - were the fibers of choice.

There is no shortage of nonwood fiber material in this country. U.S. farmers annually generate an estimated 280 million tons of excess agricultural fiber, suitable for papermaking. Generally these fibers are known to be pulped with higher fiber yields than wood and require fewer chemicals to be processed, less water, and energy.

Farmers would benefit from new income from those residues that would otherwise be burned. There would be new opportunities for value-added rotational crops; new uses for over 65 million acres of idle farmland in the United States, such as is widely found in the State of Minnesota; and new replacement options for declining industries, such as tobacco. These benefits to farmers and the environment cannot be fully realized as long as logging subsidies give an unfair advantage to wood at the expense of nonwoods and the American farmer.
— National Forest Protection Alliance, www.forestadvocate.org/case/alternatives.html

Other fiber sources do exist. In fact, many have been around for centuries. They go by a number of terms: tree-free, nonwood, alternative fibers, environmentally preferable. Generally speaking, the tree-free papers we're emphasizing in this book offer a number of environmental advantages over wood-based varieties.

This is not to say that we should no longer consume wood products of any kind. In certain heavily forested regions of the country, trees may remain the best choice of fibers. To this end, sustainable forestry initiatives have emerged in the last decade and the first U.S.–made papers containing Forest Stewardship Council (FSC) third-party certified tree pulp debuted in October 1998. Forests certified by FSC agencies adhere to strict guidelines that attempt to balance selective management practices with watershed and endangered species protection.
— Imhoff 1999

I think growing and cutting trees to make paper, in and of itself, is not a bad thing. — Michael Snyder, Forester

Trees are the best source of virgin fiber for papermaking (see question 60). Compared with alternatives (hemp, kenaf, cotton), trees are much more environmentally-friendly.

a. In temperate climates annual crops require that the soil be kept bare for 8-9 months of the year, and even when crops are growing there is bare soil between the rows. The sediment runoff from these agricultural lands is orders of magnitude greater than from forestry. This is reduced somewhat if cover crops are used, but the sediment runoff is still far greater.
b. Alternatives are almost always are non-native plants. In North America and Europe, trees grown for paper are all native plants.
c. Chemical use (fertilization, pesticides) is much lower for forestry.
d. Forestry can maintain habitat for all except old growth species, whereas non-tree field crop alternatives are essentially "non-habitat" for native species.

— Robert R. Bryan, Forest Ecologist, Maine Audubon

Since there are alternative fibres that produce high quality paper, we need to develop use of these alternatives for making paper. This does not mean that we cannot cut any trees for paper making, but we

can certainly vastly reduce the number of trees cut for paper and there should be no need to cut old growth forests to make paper. — Susan Hammond, Executive Director, Silva Forest Foundation

It makes sense to obtain our fiber needs for papermaking from trees. At the present time fiber from sustainably managed forests provides the fiber needs for the industry in the most efficient and environmentally conscious manner.
— Stora Enso

LISTENING STUDY Question 62: What are the most significant impacts of forest management?

LISTENING STUDY: Some responses reference the ecological impacts of large-scale industrial forestry while others highlight the impacts of sustainably managed forests.

Growing and harvesting trees for paper production can cause a variety of environmental impacts ranging from the destruction of plant and animal habitat to the degradation of soil and water quality, which also affects human populations.
- Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

The most significant impact of *timber* management worldwide is that caused by large clearcuts over large areas, where forest composition, structure, and function is drastically changed, often for the very long term.
— Susan Hammond, Executive Director, Silva Forest Foundation

Business-as-usual industrial forestry in the U.S. often has substantial and long-lasting environmental, social, and economic impacts. Many timber and paper companies' historical and current practices have degraded water quality, liquidated much of the land's timber "capital," played a leading role in bringing many forest species to the brink of extinction, and/or seriously impacted many other forest resources. This style of forest management is practiced on large percentages of public and private forestlands, especially on lands owned and/or logged by many industrial wood products companies. Industry and other non-federal forestlands comprise 73% of the nation's forests, and often encompass key ecosystems, forest types, and habitat areas.

Today, some U.S. companies continue to log remaining old growth, eliminate endangered species' habitats, and replace natural forests with residential sprawl and ecologically barren tree plantations. Some companies also create immense clearcuts, and apply toxic chemicals at excessive and unnecessary levels. And some also use short timber rotations that increase negative environmental impacts and fail to maximize timber production. In forests which have already been impacted, industrial forest practices are also failing to restore these forests to more natural conditions. Equally harmful practices occur in the forests of Canada and many other temperate and tropical nations -- some of which are logged to supply U.S. companies. Logging intact forests also results in net emissions of carbon dioxide and other "greenhouse" gases that are causing global climate change.
— Daniel Hall, Forest Biodiversity Program Director, American Lands Alliance

Studies from across the eastern regions have shown that even-aged management practices favored by the timber and paper industries, along with the forest roads that support logging operations, disrupt the natural processes that sustain healthy forests. Operations that are incompatible with the maintenance of healthy and sustainable forests include: large-scale clear-cut harvesting, intensive site preparation, replacement of site-adapted species with monocultures of genetically selected "super trees", increasing use of herbicides to reduce competition with the industry-favored pine trees, and concentrated use of heavy equipment. — Biodiversity Project 2003

This is an impossible question to answer. What is management? What is an impact? What is significant? What is most? Potentially, the most significant impact of forest management could be the salvation of the planet's terrestrial and perhaps aquatic ecosystems, or it could be the collapse of those same systems. Depends on who's doing what, where, when, and how.
— Michael Snyder, Forester

Positive impacts: Sustainable production of solid wood and fiber used throughout society while maintaining native forest habitat on millions of acres of land.
Negative impacts: In some regions, loss of old growth forest, conversion to short- rotation plantations.
— Robert R. Bryan, Forest Ecologist, Maine Audubon

Sustainably managed forests can be some of the best protectors of clean water, fertile soil, and animal habitats. However, poor forestry practices can lead to water pollution, soil degradation, loss of habitat, and non-productive lands. — International Paper

Roads. — Frank Locantore, Co-op America

Trees are a renewable resource and with sustainable forest management can provide us with the fiber we need for paper, building, fuel and other uses. These sustainably managed forests also provide us with additional benefits such as enhanced wildlife habitat, increased forest vigor, recreation opportunities and forest fire prevention. — Stora Enso

The forest industry stands accused of some very serious crimes against the environment: the extinction of tens of thousands of species, the deforestation of vast areas of the earth, and the total and irreversible destruction of the environment. . . . So let's talk about some of those problems and whether they're really problems or just another way of looking at how we live and how we use our natural resources. . . .

Some people hate the looks of a recent clearcut. But when foresters create openings as they harvest the trees, they do so for a very good reason. The new trees can grow back much more quickly in full sunlight. It's true that clearcuts don't look pretty when you see them from the road or fly over them in a plane, but look closer and you'll see a new forest taking root. It's younger and healthy and will provide trees for the next generation. . . .

This gives rise to the obvious concern that if we cut the trees down, all those homes and habitats will be lost and al those species will die. In recent years we've heard alarmist claims that up to 50,000 species are disappearing each year, mainly due to commercial logging. But is this true? Certainly logging has environmental impacts. When trees are cut down, some animals are displaced and must move to other parts of the forest. But as the forest regrows, the animals begin to return, often in larger numbers. As surprising as it might sound after years of sensationalism in the media, to the best of our scientific knowledge no species has become extinct in North America due to forestry. . . .

Some people want you to believe that the ugly appearance of a recently harvested forest is synonymous with permanent destruction of the environment and yet the unsightly sea of stumps is not some nuclear waste or a toxic discharge. It's actually 100% organics and will soon grow back into a beautiful new forest again. The way we think the land should look often has more to do with personal and social values than anything to do with biodiversity or science. We tend to idealize nature, as if there is some perfect state that is exactly right for a given piece of land. There are actually thousands of combinations of species at all different stages of forest growth that are perfectly natural and sustainable in their own right.

— Transcript from ***Trees Are the Answer***, video hosted by Dr. Patrick Moore, Green Spirit, 2001

LISTENING STUDY Question 63: Do forest practices differ around the United States, and does that make impacts regional?

LISTENING STUDY: Several responses reference the regional impacts of forest practices in the Southeastern United States.

Yes, forest management practices differ around the U.S and have various regional impacts. For example, in the south eastern U.S., forests intensively managed for wood and paper production generally exhibit less biodiversity, lower habitat and water quality, and poorer soil productivity than natural forests.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

The Southeast is the epicenter of industrial logging in Eastern Forests. Indeed, the region provides 60% of the total U.S. timber harvest and produces more wood products than any other nation in the world. The principal driver of the southern logging boom is the growing harvest of pulpwood for paper and chipboard. Fast-growing and genetically selected slash and loblolly pines are the chief source of pulpwood in the South, and as demand has increased, native forests have been clear-cut and replaced with heavily managed pine plantations. — Biodiversity Project 2003

Clearcutting to supply the 150 chip mills in the (Southeastern) region is damaging forest health and resiliency, water quality, soil, wildlife, biodiversity and threatened and endangered species. USFS data shows that tree species composition in the pine and hardwood forests are changing; shade intolerant species that regenerate following clearcutting are dominating the forests of the region. The survival of species that depend on mature, interior forest ecosystems is threatened by accelerated clearcutting to feed chip mills as large tracts of mature, continuous forests are fragmented and converted to young forests.
— Smith 1997

Currently, the southern U.S. is by far the largest paper-producing region in the world, with 103 pulp mills producing approximately 25% of the world's paper. Increasing production of paper and chipboard has resulted in accelerated clearcutting of southern forests and the conversion of native forests to single-species pine plantations. Since 1985, over 100 new chip mills have been constructed in the region, facilitating the expansion of paper and chipboard production. Chip mills are facilities that grind whole trees into wood chips. They are the most unregulated, highly-mechanized arm of industrial forestry, easily turning 100 truckloads of trees into chips per day.

According to the U.S. Fish and Wildlife Service (USFWS), the South has more listed endangered and threatened species than any other region in the country. Ninety percent of the forests in the South are privately owned and lack legal protections. The recent proliferation of chip mills in the southern U.S. is causing unprecedented forest destruction, degrading water quality, wildlife, threatened and endangered species, overall forest health, and our local economies. — Dogwood Alliance, www.dogwoodalliance.org/chipmill.asp

In recent years, logging has expanded in the Southern US and the Canadian Boreal forests, now the two largest paper producing regions in the world. Five million acres of Southern forests, the most biologically diverse forests in North America, are being logged each year to produce 25% of the world's paper products and two-thirds of the paper made in the U.S. Recently, the Natural Resources Defense Council named the Cumberland Plateau of KY, TN and AL on of the twelve most endangered regions in the Americas because of the impact of paper production on the region. — Forest Ethics, www.forestethics.org/html/eng/922.shtml

LISTENING STUDY: Other responses reference regional differences in forest types around the United States that necessitate unique forest practices. One response identifies specific regional impacts.

Yes, climate and tree species change from one regional part of the U.S. to another. Therefore, forestry practices are different to accommodate the regional climate. — International Paper

Around the U.S.? Hell, they differ from this stand to that one. Even from this place to that one within this stand. — Michael Snyder, Forester

Yes. Issues:
Northwest: Loss of remaining old growth, extensive areas of young plantation.
Intermountain West: Fire suppression and insufficient harvesting create unnatural wildfire hazard.
Southeast: Conversion of natural forest to short-rotation loblolly and shortleaf pine
Northeast: Most similar to natural forest processes of all regions. Old growth/late successional restoration needed due to long history of human use.
— Robert R. Bryan, Forest Ecologist, Maine Audubon

Forest practices do differ across the country. The reason for these differences is that we find a wide variety of forest types within the U.S. Specific forest practices need to be developed to address the specific conditions that each of these types offer. — Stora Enso

LISTENING STUDY Question 64: How much of all timber harvested goes into making paper?

LISTENING STUDY: Most responses reference the percentage of trees harvested worldwide.

42% of the forests cut every year go towards the production of pulp and paper. — Forest Ethics, www.forestethics.org/html/eng/776.shtml

Forty two percent of the world's total harvest of wood for industrial purposes, everything but fuelwood, goes towards paper production. - Taiga Rescue Network*(website source unknown)

Of the wood harvested for "industrial" (everything but fuelwood), fully 42 percent goes to paper production. This proportion is expected to grow in the coming years since the world's appetite for paper is expanding twice as fast as that for any other major wood product. By 2050 it is expected that pulp and paper manufacture will account for over half of the world's industrial wood demand.

The United States produces about one third of the world's pulpwood, with most of it grown in the Southeast. — Abramovitz 1999

Forty-two percent of the world's industrial wood harvest goes to paper, so using less paper is an excellent way to reduce the demand for wood products. — Co-op America, www.woodwise.org/forestissues/a.html

40% of the world's industrial logging goes into making paper and this is expected to reach 50% in the near future. - Abramovitz 1998

More than 40 percent of logged trees is used for paper. — Resource Conservation Alliance, ***Focus on Paper Consumption***

My guess is about 30-40 percent. — Frank Locantore, Co-op America

Paper is the fastest growing segment of the wood products industry and by extremely conservative estimates at least one out of every three trees harvested today ends up as pulp. Forest activists believe that percentage is far higher. — Imhoff 1999

About 30% of the wood we use is for pulp and paper, half of which is made from sawmill waste from the production of solid wood products. — Transcript from *Trees Are the Answer*, video hosted by Dr. Patrick Moore, Green Spirit, 2001

LISTENING STUDY: Other responses specify the percentage of trees harvested in the United States.

Pulpwood production (in the United States) tripled from 1952 to 2001, increasing to about a quarter of total harvest. — The H. John Heinz III Center for Science, Economics and the Environment, www.heinzctr.org/ecosystems/forest/tmbr_harvest.shtml

In the U.S., 500 million acres, an area almost three times the size of Texas, is used to grow wood for paper. — Cefola 2001

27% of roundwood production in the United States goes to papermaking. — Stora Enso (***Source: An Analysis of the Timber Situation in the U.S.***, USDA Report)

Approximately one third of all wood harvested in the U.S. is used to make paper or paper products. — Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Weyerhaeuser reported that in contrast to 1950, when it had 21 percent timber utilization per acre, by 1975 the company was converting 28 percent of the harvested timber into lumber, 10 percent into

plywood, 9 percent into particle board, and 32 percent into paper – for a total of 79 percent utilization. Some of the remaining 21 percent was used for fuel. — Cox 1985

[W]hat is generally less well understood and documented is the significant integration between pulp producers an dlumber and other wood products producers around the use of *wood residues*: shavings, slabs, chips and sawdust. This secondary materials flow in fact substantially supports the corporate organization. . . . Because there are only a certain number of solid rectilinear objects (lumber) that can be produced from cylindrical objects (logs), the yield, or proportion of lumber produced to roundwood consumed, averages only about 38 percent (softwood) to 49 percent (hardwood). In other words, *some 50 to 60 percent of the wood that enters a sawmill emerges in the form of wood residues*. Similarly, the yield of plywood and veneer products ranges from about 45 to 57 percent of the incoming roundwood, leaving the remainder as residues. On balance, slightly more than half o the roundwood (sawlogs and veneer logs) that enters sawmills or plywood and veneer mills emerges as wood residues, and these residues have become a valuable commodity in their own right. In fact, it is more accurate to view wood residue as a valuable *co-product* than as a *by-product* of lumber and other wood products manufacturing. . . .

For [1986] the U.S. Forest Service calculated that the use of wood residues from lumber, plywood, and veneer mills was apportioned as follows: pulp (55 percent); fuel (28 percent); particleboard, fiberboard, and miscellaneous industries (11 percent); and export (3 percent). Only about 3 percent of wood residues went unused, producing an overall efficiency of roundwood use approaching 100 percent. — Maureen Smith 1997

LISTENING STUDY: Still other responses reference the percentage of trees harvested in a particular region of the United States.

Currently, the southern U.S. is by far the largest paper-producing region in the world, with 103 pulp mills producing approximately 25% of the world's paper.
— Dogwood Alliance, www.dogwoodalliance.org/chipmill.asp

In Maine about 50% of all timber harvested goes into making paper. — Robert R. Bryan, Forest Ecologist, Maine Audubon

The proportion of a timber cut going to paper versus other beneficial uses is highly dependent on the manufacturing facility, geography, and local market. Maximum yields for a groundwood mill are around 50%, and about 25% for a Kraft pulp mill. International Paper gets most of the pulp for paper from thinning the forest through a saw timber rotation and therefore it is very difficult to precisely determine how much of the cut comprises a paper product. — International Paper

LISTENING STUDY Question 65: What content standards are necessary for a paper to be labeled as "made from sustainably harvested fibers"?

LISTENING STUDY: Several responses reference Forest Stewardship Council (FSC) content standards although some indicate that these guidelines are insufficient.

Forest Stewardship Council (FSC) guidelines provide much-needed international standards and legitimacy to the sustainable forestry movement. They also raise some reasonable concerns. Old-growth harvesting can still take place under exceptional conditions, though according to various sources, it is doubtful that certified foresters would sell such valuable resources for paper. In addition, current standards require that papers labeled FSC contain 25 to 100 percent virgin wood fibers, of which only 70 percent has to be FSC certified. That means as much as 30 percent of virgin wood fibers could be harvested within streamside protection zones, on steep hillsides, or using other unsustainable practices. Richard Donovan, an FSC certifier, acknowledges these shortcomings, but believes that "the intent of FSC is to move things in a better direction, and the 70 percent threshold was an important and necessary step in getting the program established." When buying an FSC paper, find out the exact amount of certified pulp it contains. — Imhoff 1999

Currently, FSC certification for the percentage of paper or paper products that is composed of virgin fiber is the only widely accepted international certification program among independent environmental advocacy groups.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

The label should state the percent of "sustainably harvested" as well as percent post-consumer recycled. The standard should be Forest Stewardship Council (FSC) or equivalent. Sustainable Forestry Initiative (SFI) is still weak in biodiversity. — Robert R. Bryan, Forest Ecologist, Maine Audubon

The Forest Stewardship Council (FSC) is a leader in establishing content standards. We would like to see 100% of all paper to be from alternative fibres and FSC-certified forests.
— Susan Hammond, Executive Director, Silva Forest Foundation

LISTENING STUDY: Another response references Sustainable Forestry Initiative (SFI) content standards to designate sustainably harvested fibers.

The Sustainable Forestry Initiative (SFI) has addressed the question of content standards by releasing labels that can be placed on products to let consumers know that they are purchasing a sustainably manufactured product. For example, a primary manufacturing company can use the SFI label on their products if 50% or more of the product's material is SFI certified. More information about the SFI standard is available online at:
www.afandpa.org/Content/NavigationMenu/Environment_and_Recycling/SFI/SFI.htm
— International Paper

LISTENING STUDY: Other responses do not specify a particular certification scheme.

No clearcuts, selective harvesting, limited roads, endangered and threatened forests never touched. — Frank Locantore, Co-op America

The content standards vary depending on the label being used. They generally require a certain percentage of content coming from a forest certified to that forest certification standard. — Stora Enso

LISTENING STUDY Question 66: How can paper manufacturers account for "sustainably harvested fibers" if they buy market pulp?

LISTENING STUDY: Responses reference many methods of manufacturers verifying sustainability, including Best Management Practices, Sustainable Forestry Initiative certification, Forest Stewardship Council certification, and general certification schemes.

Purchase deinked market pulp or FSC-certified market pulp. Currently, FSC is the only widely accepted international certification program among independent environmental advocacy groups.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Georgia-Pacific Wood & Fiber Procurement is committed to the implementation of forestry Best Management Practices (BMPs) on all lands where timber harvesting operations are controlled by Georgia-Pacific foresters. Wood & Fiber Procurement will promote the use of BMPs by all suppliers delivering fiber to a Georgia-Pacific manufacturing facility. Thus, Wood & Fiber Procurement will:

- meet state BMP standards at a minimum and may exceed where appropriate.
- actively participate in state-level processes to review and further develop technically sound BMPs.
- periodically conduct compliance assessments to ensure consistency with recommended practices, on tracts where harvesting is controlled by GP foresters.
- provide verifiable information to evaluate the results of GP's promotion of reforestation and BMPs across the procurement system.
- will not knowingly buy timber directly from landowners, loggers and suppliers who refuse to practice BMPs as outlined in their state.
- use appropriate aesthetic methods to minimize the visual impact of our harvesting operations.
- will not knowingly purchase timber that has been acquired or harvested in a manner not in compliance with the law, statues, or regulations of the area in which the timber is procured.

— Georgia Pacific, www.gp.com/forestry/enviro.html

Wood certainly won't vanish from the international paper stream in the near or possibly long-term future. So, is there a way to ensure that timber harvested in "working" forests has as minimal an ecological impact as possible? Forest Stewardship Council (FSC) certification has emerged as the international standard of choice among the environmental community as it requires an independent party to evaluate a company's activities in the field. FSC guidelines offer numerous checks and balances to reconcile intensive rotational harvesting and biodiversity protection inside the boundaries of a working forest.
— Imhoff 1999

Manufacturers would need to investigate their fiber sources and audit their environmental standards and certifications that the supplier adheres to. — International Paper

Require pulp mills to certify content. — Robert R. Bryan, Forest Ecologist, Maine Audubon

They need to purchase Forest Stewardship Council-certified pulp. — Susan Hammond, Executive Director, Silva Forest Foundation

Chain-of-custody documentation. — Frank Locantore, Co-op America

Stora Enso North America surveys all of its pulp suppliers to gather information on the sources of fiber in its purchased pulp. This can also be done with a Chain-of-Custody (CoC) certificate provided by the pulp supplier. The CoC certificate is a third party certificate that guarantees that a certain percentage of fiber content comes from certified forests. — Stora Enso

The growing concern over forest management practices has contributed to an expansion of certification initiatives in the 1990s. The Forest Stewardship Council (FSC) sponsors the best known and most credible certification program. FSC accredits certifiers who, at the request of companies wishing to use the FSC logo, audit forest management practices and certify products for the entire chain of custody, from

forest to transport to processing. FSC-certified forests must follow strict standards set forth in regionally specific principles and criteria for sustainable forest management. In late 1998, the first U.S.-produced paper containing FSC third-party-certified wood pulp arrived on the market. — Abramovitz 1999

The claim associated with the Sustainable Forestry Initiative (SFI) secondary producer's label is that the manufacturing unit procures a substantial amount of its materials from independently third-party certified sources (2/3rds minimum). This does not imply that any or all of the material originates from an SFI-certified forest. Depending on the facility, the material content of the product could originate from a variety of sources, which include:

(1) specific forest tracts managed in conformance with the SFI Standard or other acceptable standards, including all forest tracts owned or controlled by the manufacturer;
(2) a procurement system certified to be in conformance with the SFI Standard; or
(3) a combination of these two.

In all cases, a qualified independent third party confirms the content.

Material purchased through a certified procurement system generally originates from land owned by one of the over ten million private forest landowners in North America. The SFI Standard requires SFI participants to actively engage in efforts to educate landowners, as well as the professionals that harvest the wood, in the importance of sustainable forestry and the methods by which it should be practiced.

— American Forest and Paper Association, www.aboutsfi.com/sfilabel_use.asp

LISTENING STUDY Question 67: How can a purchaser verify that a paper meets an expectation that it is the end product of a sustainably managed harvest?

LISTENING STUDY: Responses reference many methods of purchasers verifying sustainability, including Sustainable Forestry Initiative certification, Forest Stewardship Council certification, and other labeling schemes.

Trust. And a healthy dose of skepticism, with verification. — Michael Snyder, Forester

Clear and unambiguous labeling with percent content by source. — Robert R. Bryan, Forest Ecologist, Maine Audubon

Currently, FSC is the only widely accepted international certification program among independent environmental advocacy groups.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Third party certification to a recognized standard such as the Sustainable Forestry Initiative (SFI) is a good way to guarantee that sustainably harvested materials are being used. — International Paper

Only through a third-party certification scheme that has standards that are widely accepted by conservation organizations, Indigenous people, and communities. Currently only the Forest Stewardship Council (FSC) system meets these criteria. — Susan Hammond, Executive Director, Silva Forest Foundation

While consumers already select forest products based on species, grade, visual characteristics, etc., they now can identify products that provide an assurance of social and environmental responsibility on the part of the producer. To do this, the Forest Stewardship Council (FSC) system requires that material be tracked from the certified source, through the Chain-of-Custody (COC). This aspect of the system is the basis for any credible certification system and is the link between consumer preference and responsible, on the ground performance. — Forest Stewardship Council***, Chain-of-Custody Fact Sheet***, www.fscus.org/images/documents/COC_Fact_Sheet.pdf

When you see the Forest Stewardship Council (FSC) checkmark on furniture or lumber, you know that a trustworthy team of professionals has traced the story of that product back to the tree. FSC stands for the Forest Stewardship Council, an international nonprofit that sets standards for responsible forestry and is supported by prominent environmental groups, as well as scientists and far-sighted business leaders. You can trust the FSC checkmark to identify products that meet high environmental and ethical standards and have been independently certified.

More and more concerned consumers care about the stories behind their wood products and are asking for FSC-certified items. To meet this demand, more companies are seeking certification, making it easier to spot the FSC label on wood products from pencils to furniture. The FSC checkmark will always help you identify lumber and products made by companies that take care of forests, protect wildlife, and help local communities prosper. — Co-op America 2001

Chain-of-custody documentation. — Frank Locantore, Co-op America

If it carries a label meeting the requirements of a forest certification standard. — Stora Enso

Sustainably Harvested Virgin Fiber: Recently, some United States forests have undergone a sustainable harvest certification process overseen by the highly regarded Forest Stewardship Council (FSC), a non-profit set up to spread the use of sustainable practices in forestry worldwide. In October, 1998, New Leaf manufactured the first FSC certified recycled paper (50% FSC certified virgin fiber, 30% post-consumer, 50% total recycled).

New Leaf Paper has a strong commitment to helping create a market for sustainably harvested virgin fiber. The best system out there is the Forest Stewardship Council or FSC system. This is a set of

independent standards for sustainable forestry. New Leaf paper launched the first coated FSC paper in North America. — Mendelsohn

Our goals as purchasers should always include minimizing the non-certified virgin wood content in the paper products we buy. This can be done by maximizing the amount of alternative tree-free fibers and post-consumer content in any paper products we purchase. (When you do choose a paper with wood-based content, look for Forest Stewardship Council certification). Generally speaking, less harmful pulping procedures that use less water and energy to convert fibers to paper are the added benefits of choosing paper with a lower virgin wood content. Third-party validation of fiber sources and pulping processes can bolster your assurance about a paper's origin. — Imhoff 1999

The issue of forest certification is becoming increasingly important as consumers realize that their purchasing decisions can help change how the world's forests are managed. Among the various certification schemes, FSC (Forest Stewardship Council) certification is the only system which carries the support of environmental and social activist groups and which attempts to balance the forests' values through a multi-stakeholder process that addresses environmental, social, and economic interests.
— Taiga Rescue Network 2001

Based on market research and requests from customers, the American Forest & Paper Association developed an on-product labeling program. The label may be used on products manufactured at facilities that procure raw or processed material in compliance with the label use requirements of the Sustainable Forestry Initiative (SFI) program. These requirements first and foremost provide that if the manufacturer owns or controls forestland, a qualified independent third party must certify that the land is managed in conformance with the SFI Standard. However, the requirements also recognize that most of these manufacturers must also purchase wood and fiber material from other sources. The label may only be used on products containing these materials if a qualified independent third party has certified that the system for procuring the materials is in conformance with the SFI Standard. — American Forest and Paper Association, www.aboutsfi.com/sfilabel_use.asp

LISTENING STUDY Question 68: What are the benefits of using tree fibers in paper?

LISTENING STUDY: Most responses indicate that trees are a renewable resource and that forests have many ecological benefits. Some responses state that the technology is already in place for converting tree fibers into paper, making trees a relatively inexpensive fiber source for paper.

Using virgin tree fiber contributes functional benefits, such as strength, that can be lacking in recovered fibers. But the largest environmental benefits actually come from maximizing postconsumer fiber. Incorporating postconsumer recycled content into paper reduces the demand for wood, lessening the adverse environmental and health impacts of commercial forestry. At a paper mill, making recycled paper is generally cleaner than making virgin paper because much of the work of separating the fibers and bleaching the pulp has already been done. Finally, recycling also reduces the amount of trash that must be disposed of in landfills and incinerators, which cuts pollution and greenhouse gas emissions.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Like many other companies and research organizations, Boise has also explored the potential for alternative fibers (for paper). However, following a review of the research, we , along with others, have concluded that the broad use of such fibers is not a viable alternative to wood fiber. Large quantities of paper that meets customers' quality and cost expectations cannot be produced from alternative sources using available technology. In addition, the use of these fibers presents many negative environmental and land use implications. — Boise Cascade, www.bc.com/environment/index.html

The benefits are that paper can be made from tree fibers and tree fibers can be produced by growing trees in healthy functioning forests that also happen to do and provide much more than fibers alone. — Michael Snyder, Forester

Tree fibers are a renewable raw material. Forests provide much better habitat, water protection, and other environmental values than agricultural monocultures that might be used in paper products. Tree fibers are still needed to produce recycled paper because recycled fibers only last 3 or 4 “rotations” until they are degraded beyond use. It usually takes less fossil fuel based energy to produce paper from virgin tree fibers than recycled paper.

Using trees provides an incentive for landowners to keep their lands forested. If there is no longer a market for trees, landowners may choose to sell their land for other uses or develop them. At a pragmatic and realistic level, trees are a relatively cheap resource in many parts of the world, i.e. Russia, and will continue to be used for forest products by the people of these nations to help improve their economies. — International Paper

Old growth trees are valued for their long fibers that contribute to the strength of papers. However, there is no advantage to using plantation or young second-growth trees because they do not have long fibers.
— Susan Hammond, Executive Director, Silva Forest Foundation

Trees are a renewable resource and with sustainable forest management can provide us with the fiber we need for paper, building, fuel and other uses. These sustainably managed forests also provide us with additional benefits such as enhanced wildlife habitat, increased forest vigor, recreation opportunities and forest fire prevention. — Stora Enso

LISTENING STUDY Question 69: Is there an optimal amount of virgin tree fiber that should go into paper to ensure high quality/optimal performance?

LISTENING STUDY: Most responses indicate that paper needs to contain some virgin tree fiber but that the specific amount may depend on the paper grade and could decrease with more research.

Wood fibers can be recycled only five to seven times before they become too short and brittle to be made into new paper. At that point, new fiber must be mixed with fiber from recycled paper to form new paper products. Consequently, if the supply of virgin fiber were completely eliminated, the supply of recycled paper would systematically shrink until it too was completely eliminated. To sustain the supply of recycled paper, virgin fiber must constantly be added to the mix. — Boise Cascade, www.bc.com/environment/index.html

The "optimal" amount of virgin fiber varies based on paper grade and use. However, the quality and performance of postconsumer recycled content papers has increased dramatically over the last several years. Our research has shown that papers with high levels of postconsumer content meet the same quality and performance levels as virgin.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Recent tests confirm that 30% postconsumer recycled office papers can match the quality specifications of virgin for copy paper. — Cefola 2001

Every paper grade has its own specific formula for creation. Different paper grades and products will require different amounts of fiber. — International Paper

I would need to see studies that compare the quality and performance of papers made from various sources such as old growth trees, plantation and second growth trees, hemp, straw, kenaf... — Susan Hammond, Executive Director, Silva Forest Foundation

No, it varies, and with appropriate priority placed on research, that percentage should continually decrease.
— Frank Locantore, Co-op America

Yes, this depends on the type of paper made. Some papers that require significant strength or are very lightweight have higher requirements for virgin fiber. Generally speaking, the recycled fiber content can increase for papers requiring less strength. — Stora Enso

LISTENING STUDY Question 70: Are genetically engineered trees appropriate for papermaking?

GMOs are plants, animals, bacteria or other living organisms that have been genetically engineered by the insertion of a foreign gene. For centuries, farmers and plant breeders have improved crops and livestock, and to a lesser extent trees, by isolating and selecting for breeding the individuals with the most desirable traits. Everything has hinged on sexual reproduction: only by breeding within the same genus have advances been made. Genetic engineering has changed all this. It has enabled scientists to dispense with sex and cross the genus barrier. — Fast-Wood Plantations . . .

LISTENING STUDY: Most responses state that the use of genetically engineered trees for papermaking must be investigated further before this technology is applied.

The jury is still out. — Frank Locantore, Co-op America

Stora Enso has decided to refrain from any commercial use of controversial genetic engineering techniques on trees or any other organisms. Nevertheless, Stora Enso will continue to take part in basic research in this area in order to keep up to date with developments. This research will not lead to any commercial applications, however. — Stora Enso

Boise believes that the careful use of genetically modified trees should be scientifically investigated. We believe that genetically modified trees may help meet the growing demand for wood and paper products worldwide, may effectively compete in the marketplace, and help sustain the world's forest resources. If new varieties of trees are developed for commercial use, precautions should be taken to assure public confidence. At the same time, any regulations or oversight must be prudent and thoughtful and must not impose unreasonable barriers, unnecessarily impede field trial investigation or interfere with timely operational applications.
— Boise Cascade, www.bc.com/environment/index.html

A World Wildlife Fund scoping study surmises that the main impact of transgenic trees might not be genetic pollution, or the creation of super weeds, but 'the contribution that [genetic engineering] might make to unsustainable land use.' The study suggests that trees engineered for enhanced growth will generally be voracious consumers of water and nutrients, and thus will have the potential to degrade land. However, similar objections could be raised for the non-GMO eucalypt clones, raised through tissue culture, which are delivering astonishingly high yields, most famously in the Aracruz plantations of eastern Brazil. Nevertheless, it is true that genetically improved or genetically modified trees will fulfill their true potential only when the right growing conditions are provided. They must be planted in suitable climates with adequate water and they will nearly always require the use of fertilizers. They may also demand relative freedom from weed competition when young, and this means that herbicides must be used. Current objections to GMOs, like the defense of GMOs, are based on scientific theory. We lack empirical evidence. The jury is out still. — Cossalter 2003

Attackers Fell Finland's Only GM Tree Study: Attackers have torn up 400 genetically modified birch trees in Finland, wrecking the nation's only research into the environmental impact of biotechnology on forests. . . . The trees were chopped down or torn up by their roots at the weekend on the fenced but unguarded 2,000-square-metre site. Some environmental groups fear genetically modified trees might irreversibly "contaminate" food crops and wild species, an issue the study aimed to investigate.

"The research investigated the possible environmental effects of doing field studies using genetically modified materials. It would have been extremely important to find out about these issues," said research station head Juhani Haggman.

The 400 birches were part of Finland's only field study on genetically modified trees. The forestry industry hopes genetic modification could cut paper-making costs and improve products by producing trees with suitable traits. "We lack research on how genes work," Haggman said. Researchers on the government-funded Finnish Forest Research Institute (Metla) project were working on the felled trees to collect any data that remained, Haggman said. The study was due for completion at the end of 2005.
— Reuters, reported on Paperloop.com, June 23, 2004

LISTENING STUDY: Other responses indicate that genetically engineered trees should not be used for papermaking.

No. With some very limited exceptions, there is no real need for genetically engineered trees. Meanwhile, the risks are far too high that pollen and seed from genetically engineered trees will mix with natural forests, and permanently alter those forests. Existing federal, state, and international safeguards for genetically modified organisms are considered highly inadequate by many scientists and conservation organizations. — Daniel Hall, Forest Biodiversity Program Director, American Lands Alliance

The problem with genetically engineered trees is that generally (almost always in the US and Canada) the engineered trees are planted in an area where native forests of the same species are present. This means cross-pollination will likely occur with native forest trees, which is totally unacceptable. If it can be shown that a genetically modified trait cannot be transferred through pollen, then this risk would appear to be eliminated. — Robert R. Bryan, Forest Ecologist, Maine Audubon

Should we oppose genetic "improvements" to trees on public lands? Sierra Club believes that we can't allow the industry to be judged by its hype and that patented genes are not an improvement over nature. We also must avoid only judging what one gene may do, because once hundreds of different fragments of hacked, patented genetic code are allowed access to public lands, the consequences of unintended combinations will be unpredictable. GE trees will also be a danger in other nations, particularly in the underdeveloped world where conditions for effective regulation often don't exist.

We would also point out that the United States is using twice as much paper per capita as other highly civilized nations (Europe, Japan). Let us not ask genetic engineering to do what could be accomplished by lower-tech means like putting a surcharge on junk mail. — Sierra Club, www.sierraclub.org/biotech/trees.asp

Bioengineered Trees Stir Debate - Sierra Club, Fearful of Projects Going Awry, Seeks Moratorum: . . . Scientists are planting genetically engineered trees in dozens of research projects across the country, ignoring the pleas of environmentalists who fear dangerous, unintended consequences.

"It won't be as widespread as agricultural biotechnology, but it could be much more destructive," said Jim Diamond, chairman of the Sierra Club's genetic engineering committee. "Trees are what's left of our natural environment and home to endangered species." The Sierra Club wants a moratorium on the planting of genetically engineered trees outdoors until the science is better understood. But like a tree falling deep in the forest, its call has gone unheeded.

The tree researchers say their critics are missing all the ways that science can give Mother Nature a fighting chance against ravages natural and manmade. Biotechnology, they say, may provide just what's needed to help reverse global deforestation and industrial pollution while satisfying increased demands for wood and paper products. . . .

"There is a lot of value in genetic engineering," said Oregon State University researcher Steven Strauss, who tends to a few thousand engineered trees. Some researchers are infusing trees with genetic material taken from viruses and bacteria that helps them row faster and fatter and yield better wood. Others are splicing mercury-gobbling bacteria genes into trees, enlisting nature to help clean polluted soil. Still others are inserting foreign genes that might reduce the amount of toxic chemicals needed to process trees into paper. . . .

But could biotech trees cross-breed with their natural brethren and ruin forests' genetic diversity? The Sierra Club fears that, among other ecological consequences. Researchers hope to placate critics by engineering sterility into their designer trees, so their impact on the environment can be contained. But that technology remains elusive.

Many field trials are backed by paper and timber concerns hoping to design trees that yield more wood and paper. . . . Most explore ways to streamline timber and pulp production, said [ArborGen LLC] Chief Technology Officer Maud Hinchee. She said the company's work could reduce reliance on national forests, with faster growing trees growing on industry plantations. . . . Numerous projects are aimed at growing more wood on less land or making it cheaper and less environmentally harmful to process trees in mills. . . .

Oregon State's Strauss says the protesters legitimate concerns are virtually identical to those of scientists.

— Paul Elias, Associated Press, reported in the ***Marin Independent Journal***, Business section, August 1, 2003

Organisations such as Greenpeace and Friends of the Earth, which have long expressed their fears about GMOs in agriculture, have been joined in their campaigns against 'Frankentrees' by groups like the Native Forest Network, which claims that 'native forests ... are threatened worldwide by genetically engineered tree plantations.' — Fast-Wood Plantations . . .

Environmentalists have also suggested that genetic engineering of trees for reduced lignin content and for insect resistance might not prove to be as beneficial as the biotechnologists hope. Take, for example, lignin, which confers physical strength on trees and constitutes part of their defence mechanism against pests. Reducing lignin content could make trees more susceptible to pest attacks, and consequently more pesticides would be required in plantations. — Fast-Wood Plantations . . .

LISTENING STUDY: Some are positive.

Biotechnologists are also looking for genes that code for the enzyme that breaks down lignin. Up to a third of a tree's dry weight is lignin, which must be removed at considerable cost when pulpwood is turned into paper. Plantations of low-lignin trees could help reduce pulping costs. It is claimed that this would also be good for the environment, as lignin removal is an environmentally hazardous process. — Fast-Wood Plantations . . .

LISTENING STUDY: Other responses:

How do you define genetically engineered trees? I think the larger question is more important: can paper be made effectively (quality, cost) from fibers other than that from trees?
— Susan Hammond, Executive Director, Silva Forest Foundation

There is no reason to believe that genetically engineered trees would be inappropriate for papermaking. There may be distinct advantages to raising genetically modified trees for making paper that range from greater disease resistance to less need for fertilizers. — International Paper

LISTENING STUDY Question 71: What percentage of domestic pulp is from genetically engineered trees?

The first genetically modified trees were produced in 1987, and by 1998 there had been at least 116 confirmed GM tree trials around the world. — Fast-Wood Plantations

Thus far, no applications for unrestricted, commercial use of genetically engineered (GE) trees have yet been filed for forestry. But some GE trees are already quite advanced—for instance, herbicide-tolerant poplar—and the first commercial planting of a GE tree could take place as early as 2002-2003.
— Greenpeace International 2000

At the present time, there are no commercial plantations of genetically engineered trees in the U.S. or Canada. In Canada, only four experimental plots have been established since 1997. Three were established by the Canadian Forest Service, one by the private company Alberta-Pacific Forest Industries. Canadian Forest Service officials expect GE trees to be planted commercially within 5 - 10 years. In the U.S., there are a few hundred experimental plots. Regulators at the USDA expect no requests for approval of commercial plantations for at least four years. Once an application is received, the agency review and public comment periods would probably consume several more years before any approval could be granted. — Campbell 2000

This information is not presently available. — Stora Enso

Growing plants in greenhouses prevents spread of the genetic material, while field trails "release" the plants in open plantings. Between 1988 and 1998 there were at least 116 releases of Genetically Engineered trees, with nearly half occurring in 1998. Most of these are species used by the pulp and paper industry, and the majority of these releases have been in the United States.
— Native Forest Network 2000

Bioengineered Trees Stir Debate - Sierra Club, Fearful of Projects Going Awry, Seeks Moratorum: . . . Scientists are planting genetically engineered trees in dozens of research projects across the country. . . . Papayas are the only approved engineered tree for market. The rest are still experimental.

About 230 notices of genetically engineered tree experiments have been filed with the United States Department of Agriculture since 1989, with about half coming since 2000. . . . Poplar, eucalyptus, apple and coffee trees are among those being engineered. . . . These experimental tree plots are much smaller in scale than the 100 million acres of genetically modified food crops planted last year.

Except for the Hawaiian papaya, no genetically modified tree is expected to be commercialized for the next five to ten years. Trees grow much slower than crops, and genetic researchers need years to compare and contrast generations.

. . . Many field trials are backed by paper and timber concerns hoping to design trees that yield more wood and paper. ArborGen LLC, a North Charleston, SC-based biotechnology company, said it has 50 separate field trials under way. . . . ArborGen, launched in 2000 with $60 million from International Paper, MedWestvaco Corp. and two New Zealand companies, has grown from five employees to 53.

. . . Forestry researchers are proud of their work, but have learned to be circumspect about disclosing where their genetically engineered trees are growing. In June, three protesters were arrested after chaining themselves inside a UC Davis science building to protest tree research. Two years ago, the Earth Liberation Front claimed responsibility for arsons at the University of Washington Center for Urban Horticulture in Seattle and Jefferson Poplar Farms in Clatskanie, Ore., that together caused more than $3.5 million in damage. . . .
— Paul Elias, Associated Press, reported in the ***Marin Independent Journal***, Business section, August 1, 2003

LISTENING STUDY Question 72: What is the percentage of paper fiber coming from natural forests vs. tree plantations?

LISTENING STUDY: Several responses state a specific percentage of fiber coming from tree plantations.

Currently, plantations account for less than one-third of fibre for paper, but the global trend is for increasing reliance on plantations or intensively managed forests which resemble plantations and towards large scale forest enterprise, with natural forests being increasingly managed for multiple-uses and conservation. — Robins 1996

In the mid-1990s, pulpwood plantations furnished about 16 percent of the world's total fiber supply for paper. Second-growth forests provided 30 percent, and old-growth forests 9 percent. (Total of 55 percent virgin wood) — Abramovitz 1999

Indonesia's pulp and paper industry demands far more wood than its plantations can supply. As a result more and more tropical rainforest area is being destroyed. Between 1988 and 1999 a mere 8 percent of the wood used for pulp originated from plantations, the remaining 92 percent came from tropical rainforests. — Friends of the Earth International 2002

Very low (likely less than 1%) in Maine. — Robert R. Bryan, Forest Ecologist, Maine Audubon

Given the absence of a global information system on fibre sources, IIED commissioned a survey of the situation in 1993 which revealed that:

- managed natural regeneration forests are the single largest source of wood fibre (37 per cent);
- unmanaged natural regeneration forests account for 17 per cent of wood fibre supply;
- plantations provide 29 per cent of global wood pulp
- original conifer forests account for 15 per cent of total wood pulp;
- tropical rainforests provide only 1 per cent of global wood pulp, and original hardwood forests elsewhere in the world provide another 1 per cent.

— World Business Council for Sustainable Development 1996

In several countries industrial wood production from forest plantations has significantly substituted for wood supply from natural forest resources. Forest plantations in New Zealand met 99 percent of the country's needs for industrial roundwood in 1997; the corresponding figure in Chile was 84 percent, Brazil 62 percent, and Zambia and Zimbabwe 50 percent each.
— Food and Agriculture Organization of the United Nations 2000

LISTENING STUDY: Other responses do not specify percentages.

In the southeast, most of International Paper's land is 4th and 5th rotation plantation forest. About 30% of the fiber in our paper products comes from our own lands. We do not track statistics for "natural" versus "plantation" for fiber that comes from other people's land. As the Southern Forest Resource Assessment details, the forests of the U.S. south are generally healthy and sustainably managed. Even with the projected increase in plantation forests over the next 40 years, natural forests (which generally have grown up from abandoned farm fields) will still dominate the southern landscape. Therefore, we are not concerned that the natural forests of the southeast are endangered. We do, however, believe that certain ecological communities within the forests from which we obtain tree fiber are endangered; these communities are catalogued by Nature Serve: www.natureserve.org/explorer. As part of our commitment to the Sustainable Forestry Initiative (SFI) Program, we protect and conserve such communities. In addition, the SFI Program obligates us to manage on a landscape level while also providing wildlife habitat and biodiversity at the stand level of the forest. — International Paper

This information is not readily available. — Stora Enso

LISTENING STUDY Question 73: Are tree plantations a viable alternative to natural forests for pulp supply?

LISTENING STUDY: It is important to note that there are many different kinds of tree plantations, and the problems presented by some are not always presented by all. Discussion, therefore, should be specific about which types of plantations, which geographic areas, and which local issues are under discussion.

LISTENING STUDY: Some responses suggest that tree plantations may be used for pulp supply and can help relieve pressure on natural forests.

Sure, I think they can and should be in the mix. — Michael Snyder, Forester

The conversion of natural forests to tree plantations is a serious environmental concern. In the U.S. South, where most of the trees used to make paper are grown, pine plantations grew from 2 million acres in 1953 to 33 million acres in 1999. Forests intensively managed for wood and paper production generally exhibit less biodiversity, lower habitat and water quality, and in some cases reduced soil productivity relative to natural forests.
— Victoria Mills, Project Manager, Corporate Partnerships, Environmental Defense

Boise began fiber farming in 1991 on land near our pulp and paper mill in Wallula, Washington. Fiber farming is an innovative agricultural enterprise dedicated exclusively to producing wood fiber for papermaking. Compared with traditional forestry, fiber farming can economically produce more fiber from less acreage in less time. Designed, located, and managed as farms, these agricultural operations can provide a stable source of high-quality fiber for manufacturing paper. The forest products industry will always need adequate, dependable harvests from public and private forests for most of the fiber required to make the vast quantity of paper and wood products our society uses, but fiber farming will likely grow as a supplemental source of that fiber. — Boise Cascade, www.bc.com/environment/index.html

In theory, the global demand for paper could be met from a plantation area of 40 million hectares, or roughly the size of Sweden which is a small percentage of the total global forest cover, currently 3,440 million hectares. In the long run, there is no need to rely on original natural forests for pulpwood.

If management practices, particularly on social issues, continue to improve, this (plantations) could be an acceptable way of providing fibre. The challenge is to manage both plantations and natural forests so that between them the different demands from forests are covered.
— Robins 1996

Forest plantations, if managed sustainably and in conjunction with natural forests on the landscape, can provide most or all of the ecological functions of a natural forest ecosystem. In addition, using fiber from fast-growing forest plantations takes harvest pressure off of intact natural forests. — International Paper

Plantations can provide increased yield compared to natural forests. — Stora Enso

If plantation development is targeted at the most appropriate ecological zones and if sustainable forest management principles are applied, forest plantations can provide a critical substitute for natural forest raw material supply. This substitution by forest plantations may help reduce logging pressure on natural forests in areas in which unsustainable harvesting of wood is a major cause of forest degradation and where logging roads facilitate access that may lead to deforestation. — Food and Agriculture Organization of the United Nations 2000

While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration of, natural forests.

Well-managed plantations can help meet the increasing demand for forest products. Demand for forest products such as timber, paper and firewood continues to grow. This demand places considerable pressure on the world's forests. By growing our wood products in plantations, it is possible to preserve other forests, such as old-growth and high biodiversity forests, and still meet out demand for wood.

— Forest Stewardship Council**,**
www.fscus.org/images/documents/FSC_Principles_Criteria.pdf and
www.fscus.org/images/documents/international_facts_sheets/FSC_Plantations.pdf

The key to conserving biological diversity in the world's forest ecosystems may have two sides: the protection of large, undisturbed bioreserves in which the pathways for penetration by alien invasive species is actively minimized; and intensively managed plantations to meet global wood fiber needs from the smallest possible area, while relieving development pressures on those remaining large, native forests. — Sample 2003

LISTENING STUDY: Other responses indicate that tree plantations may be used for pulp supply, but only under specific circumstances.

Generally, "no." In some cases, plantations may be an ecologically acceptable alternative, such as when they are established on former agricultural lands, and are managed to avoid impacts to water supplies, fish and wildlife, and other values. However, in the US, most
plantations are established by eliminating the natural forests that would normally exist on those sites.
— Daniel Hall, Forest Biodiversity Program Director, American Lands Alliance

Objections to plantations are based largely on their perceived "monoculture" characteristics. The challenge is to build more diversity and resilience into plantation systems. It is probably inevitable that plantations will increasingly become the focus for wood pulp production. They offer significant opportunities for increased income and employment in many developing countries. However, plantations should be established on lands of low conservation value, and where there are few competing uses or irreconcilable rights or claims. — World Business Council for Sustainable Development 1996

They (tree plantations) are best viewed as a compliment, not an alternative. Because plantations can be used to grow more fiber per acre, they can be used to take to pressure off natural forests and allow more wilderness areas and old growth forests to be set aside. — Robert R. Bryan, Forest Ecologist, Maine Audubon

Proponents (of plantations) argue that intensively managed plantations will create jobs, rehabilitate degraded areas, combat climate change by absorbing carbon, and help "save" forests by providing most of the world's wood needs from a much smaller parcel of land than natural forests might by themselves.

But plantation development as it is currently unfolding within the pulp and paper industry is not without drawbacks. When compared to degraded farmland, plantations may provide more ecosystem services such as wildlife habitat and soil protection, but when compared to a mature, native forest, they simply don't measure up. Like virtually all large-scale monocultures, plantations are susceptible to disease and pest outbreaks, so they commonly require regular applications of insecticides and fungicides. Herbicides are also used to prevent invasion of competing vegetation. The frequent harvests and site preparation procedures can result in soil degradation that reduces the long-term viability of the land. A mature pulpwood plantation might look like a natural forest, but it actually has about as much in common with a natural forest as a cornfield does with a native prairie.

Some types of plantations can play a role in reducing the environmental impacts associated with the production of pulp for paper. Farming trees in a sustainable way is clearly preferable to harvesting the world's last remaining old-growth stands. But in general, plantations can be managed much better than they are now. It is important that they be established on lands that truly are degraded—that are not currently forested, farmed, or inhabited, and do not have high potential to regenerate naturally.
— Abramovitz 1999

We believe that it is essential that governments adopt a landscape approach to plantation development. Investment in plantations should not be considered, and permission for private companies to establish plantations should not be given, if it can be demonstrated that the plantations will prevent the delivery of a full range of forest goods and services at the landscape level. For example, if a plantation is likely to adversely disrupt the hydrological cycle or reduce water quality, then it should not be established. Likewise, plantations should not be established if they have an adverse effect on local communities; if, for

example, they are likely to lead to a net loss of employment or to local communities being deprived of firewood, grazing land and other goods and services on which they depend. All these factors should be considered together, not independently, as there may be trade-offs that are acceptable. In any case, local communities, like other stakeholders, need to be involved at the earliest stage of planning and development. Finally, we must stress that there should be a presumption against any planting which would lead to the loss of primary forest, ecologically significant secondary forest or other important ecosystems. — Cossalter 2003

Tree plantations would need to be Forest Stewardship Council-certified and should still be used only in combination with recycled fiber and alternative fiber sources.
— Susan Hammond, Executive Director, Silva Forest Foundation

LISTENING STUDY: Still other responses suggest that tree plantations should not be used for pulp supply due to undesirable environmental impacts.

Plantations Destroying Biodiversity: According to world-renowned forest ecologist and Harvard professor E.O. Wilson, an industrial tree plantation has 90–95% less species diversity than a native forest. In addition, the use of chemical herbicides and pesticides is becoming more prevalent in pine plantations as a means of stimulating pine growth by eliminating competing hardwoods and other plant species struggling to regenerate after a clearcut.
— Dogwood Alliance, www.dogwoodalliance.org/chipmill_impacts.asp

They (tree plantations) could be in theory, but I haven't heard of an ecologically-sustainable one in practice. — Frank Locantore, Co-op America

While certain areas in the continental U.S. will see expanding plantations, notably the coastal Southeast and the Pacific Northwest (where poplar plantations already cover more than 40,000 acres in Oregon), most plantations will be in the Southern hemisphere. These plantations replace native forests, yet fail to provide the wide range of ecological functions provided by natural forests. These include watershed services, plant and animal diversity, and a local resource for wood, food, and medicines. — Native Forest Network 2000

Groups Urge End to Subsidies for Fast Forests: Key environmental and research groups . . . called for an end to what they said were economically and ecologically damaging subsidies for fast-growing tree plantations, a major source of pulp for paper. In a joint report issued for a United Nations conference on preserving natural forests, they also said that richer countries would have to cut consumption of paper and packaging if the forestry industry were to survive in the longer term.

"Evidence we have collected shows that most subsidies to the (fast-forest) plantation industry are perverse -- they are bad both for the economy and the environment," Chris Elliott of the World Wide Fund for Nature (WWF) told a news conference. The report, "Fast-Wood Forests: Myths and Realities", was compiled by the Swiss-based WWF and World Conservation Union (IUCN), as well as the Jakarta-based Centre for International Forestry Research and Forest Trends of the United States.

It argues that by reducing the cost to private firms of starting up fast-wood forests, government subsidies allow them to destroy natural forests which are vital to the ecology and the economy but which take much longer to produce timber. Ending subsidies would ensure that forest businesses only moved into areas where they could cover their costs, it says.

. . . Fast forests . . . contain single tree species and produce harvestable timber in less than 20 years, against up to 50 in normal forests.

. . . But the report rejected arguments . . . that large plantations were inevitably harmful. Well-managed, and created on otherwise unused land, they could aid development, boost local economies by providing jobs, and stimulate the natural environment, according to the report. — Reuters, reported on Paperloop.com, May 27, 2003

LISTENING STUDY: There are many papers and reports on issues regarding tree plantations. One that tries to analyze the competing viewopoints is *Fast-Wood Forestry: Myths and Realities*, by Christian Cossalter and Charlie Pye-Smith, May 2003. Rather than

A forward signed by CIFOR, WWF International, IUCN, and Forest Trends reads:

Each year the area of fast-growing tree plantations in the world expands by around one million hectares. The planting of large areas of eucalypts, acacias, pines and poplars has sparked off bitter controversy, especially in the developing world. Some claim plantations will destroy the environment and displace small farmers. Others say they will help protect natural forests and provide economic growth. Most of the public does not know what to believe.

As four of the main international organizations concerned with forests, we are committed to promoting an informed debate about this controversial topic. We believe that 'Fast-Wood Forestry—Myths and Realities' by Christian Cossalter and Charlie Pye-Smith makes a major contribution to that debate. It is the most up-to-date, credible and balanced report on the topic thus far. Over thirty of the world's leading experts from all sides of the debate have reviewed the report and provided detailed comments.

Establishing plantations might sound like a laudable activity. Trees, after all, have many virtues. They convert water, sunlight and carbon dioxide into wood and oxygen, and it is frequently claimed that they regulate the water cycle, stabilise steep slopes against erosion and prevent flooding. Trees also provide a habitat for countless creatures and micro-organisms, and hundreds of millions of people rely on them for timber, firewood, fruit, nuts, resins and other products. Planting trees, it would seem, is an unreservedly good thing.

Or is it? During recent years the planting of large areas of fast-growing trees has sparked off much controversy, especially in the developing world. Critics of these 'fast-wood' plantations include environmentalists, who argue that they are replacing natural forests and causing harm to wildlife, water resources and the soil, and local communities, who complain that plantations are taking over land which previously provided them with the means to feed themselves and earn a living. The controversy is also about the use, or misuse, of public money.

. . . This booklet examines the various arguments for and against fast-wood plantations. This is a complex topic. Sometimes planting trees is an excellent way to use the land; sometimes it is not. In one location a plantation of fast-growing eucalypts might have a profoundly negative impact on wildlife, or reduce the amount of water available to other users. Yet a similar plantation elsewhere might do little or no harm to wildlife and water resources. A plantation of fast-growing pines might produce significant social and economic benefits. Yet a similar plantation elsewhere might lead to changes that hurt local communities.

Besides looking at the impact of fast-wood plantations on wildlife, water and the soil, we also examine the claim made by those in favour of fast-wood plantations that their ability to produce large quantities of wood fibre over a relatively short period of time helps to reduce the pressure on natural forests. We also examine in some detail the desirability, or otherwise, of using public money to encourage fast-wood forestry.

. . . It is important to define, at the outset, precisely what we mean by fast wood and to indicate the ways in which fast-wood plantations differ from other plantations.

Plantations come in many shapes and guises, and are established for a variety of reasons. Some provide shelter, shade and fodder for livestock; others fuelwood for households, and timber for furniture and the construction industry. Sometimes they are established for the benefit of wildlife or as a recreational resource. Plantations may even provide a valuable service to urban populations, particularly in arid zones, by absorbing storm and sewage water. And plantations frequently fulfil a whole range of roles—for example, by providing peasant farmers with fodder, villagers with fuelwood and industry with high-quality timber.

The sole purpose of fast-wood plantations, in contrast, is to produce large volumes of small-diameter logs at competitive prices as quickly as possible, yielding at least $15m^3$ of wood per hectare per year. Although fast-wood plantations produce a range of goods, most have just one function. Some supply wood to make panel products and reconstituted boards; some supply charcoal; a few provide

sawn logs; and, most important of all, fast-wood plantations supply pulpwood, the raw material for the paper industry.

. . . [Many environmental] groups would more or less concur with the critique advanced by Ricardo Carrere and Larry Lohmann in *Pulping the South.* 'As swatches of exotic trees invade native woodlands, grasslands, farmlands and pastures,' suggest the authors, 'the results, in country after country, have been impoverishment, environmental degradation, and rural strife.'

No coherent lobby actively promotes fast-wood plantations at an international level. However, industry-led groups lobby for plantations, and rebut the allegations of those opposed to fast-wood forestry, in several countries. Many companies, foresters, academics, development agencies and institutions also believe that fast-wood forestry is useful to society, and we examine their arguments as assiduously as we do those of the anti-plantation movement.

References

Abramovitz, Janet and Ashley Mattoon, *Paper Cuts: Recovering the Paper Landscape*, Worldwatch Paper 149, December 1999.

Abramovitz, Janet, *Taking a Stand: Cultivating a New Relationship with the World's Forests*, Worldwatch Paper 140, 1998.

American Lands Alliance. Hall, Daniel. Forest Biodiversity Program Director – Email Correspondence. February 23, 2004.

Biodiversity Project, "Threats to the Health of Eastern Forest Ecosystems," *Getting on Message: Eastern Forests and Biodiversity*, 2003. <www.biodiversityproject.org/EF%20Kit/EFThreatstoecosystems.pdf>

Campbell, Faith Thompson, *Genetically Engineered Trees: Questions Without Answers*, July 2000. <www.americanlands.org/forestweb/getrees.htm>

Cefola, Jackie, "Developing the Less-Paper Office: Strategies for Cost Reduction and Environmental Benefits," *Purchasing Pulse*, Vol. II, Issue 13, 2001. <www.environmentaldefense.org/alliance/PurchasingPulse_officepaper.html>

Co-op America, *WoodWise Consumer Guide 2001*. <www.coopamerica.org/woodwise/consumerguidegoodwood.htm>

Cossalter, Christian and Charlie Pye-Smith, *Fast-Wood Forestry: Myths and Realities*, Center for International Forestry Research, Indonesia, 2003. <www.panda.org/downloads/forests/fastwood.pdf>
De Galembert, Bernard, "Wood Supply for the growing European pulp and paper industry," Seminar on Strategies for the Sound Use of Wood, Economic Commission for Europe/Food and Agriculture Organization, Romania, March 2003. <www.unece.org/trade/timber/docs/sem-1/papers/r4Galembert.pdf>

Cox, Thomas R. and Robert S. Maxwell, Phillip Drennon Thomas, and Joseph J. malone, *This Well-Wooded Land: Americans and Their Forests from Colonial Times to the Present*, (Lincoln: University of Nebraska Press, 1985)

Food and Agriculture Organization of the United Nations, *Global Forest Resources Assessment 2000 Main Report*. <www.fao.org/DOCREP/004/Y1997E/Y1997E00.HTM>

Food and Agriculture Organization of the United Nations, *The Challenge of Sustainable Forest Management – what future for the world's forests*?, 1993. <www.fao.org/docrep/T0829E/T0829E00.htm>

Friends of the Earth International, "Friends of the Earth Netherlands Confronts Company with Chainsaw," Amsterdam, December 2, 2002. <www.foei.org/media/2002/1203.html>

Greenpeace International, *Pulp Fiction: Genetically Engineered Trees*, October 2000. <http://archive.greenpeace.org/geneng/reports/gmo/pulpfiction.pdf>

Imhoff, Dan, *The SimpleLife Guide to Tree-Free, Recycled, and Certified Papers*, SimpleLife Books, Boonville, CA, 1999. <www.watershedmedia.org/paper/paper-thecase.html>

International Paper. Email Correspondence. August 12, 2003.

Locantore, Frank. – WoodWise Program, Co-op America. Email Correspondence. April 3, 2004.

Maine Audubon. Bryan, Robert. Forest Ecologist – Email Correspondence. March 9, 2004.

Mendelsohn, Jeff, CEO New Leaf Paper, comments excerpted from "Creating a Sustainable Paper Industry: The Big Picture and Actions You Can Take Today," 2002. <http://www.nwf.org/campusEcology/HTML/drivingsustainablemarkets.cfm>

Mills, Victoria - Project Manager, Corporate Partnerships, Environmental Defense. Email Correspondence. September 9, 2004

Ministerial Conference on the Protection of Forests in Europe, "Helsinki Resolution (H1)," Proceedings: A Commitment to Sustainable Forest Management in Europe, Helsinki, 1993. <www.mcpfe.org/index.php?sel=1&lang=en&kat=1>

Montreal Process, "Santiago Declaration," Proceedings: Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, Santiago, Chile, 1995. <www.mpci.org/rep-pub/1995/santiago_e.html>

Native Forest Network, *Genetically Modified Trees: A Global Threat*, Eastern North America Special Report, March 2000.

Northern Forest Alliance, *Forestry for the Future: A Strategy for Sustainable Forestry in the Northern Forest*, February 1999, http://www.northernforestalliance.org/forestry.htm

Northern Forest Lands Council, *Finding Common Ground: Conserving the Northern Forest*, 1994. <www.northernforestlands.org/publications.htm>

Paper Task Force, *Paper Task Force Recommendations for Purchasing and Using Environmentally Preferable Paper*, 1995. <www.environmentaldefense.org/pdf.cfm?ContentID=813&FileName=PTFcomplete.pdf>

Partin, Tom, President of American Forest Resource Council, "An Idea in Search of a Definition," *Forest Magazine*, Winter 2004.

Penna, I. W., *The Political Ecology of the Japanese Paper Industry*, Doctor of Philosophy dissertation, School of Anthropology, Geography and Environmental Studies, University of Melbourne, Parkville. 2002. http://www.geography.unimelb.edu.au/research/DrPenna.html

Resource Conservation Alliance, *Focus on Paper Consumption*, Using Less Wood Quick Facts Series. <www.woodconsumption.org/products/paper.pdf>

Robins, Nick and Sarah Roberts, *Rethinking Paper Consumption*, International Institute for Environment and Development, London, 1996. <www.iied.org/smg/pubs/rethink.html#preface>

Salge, Oliver, Director of Forest Issues, Greenpeace, "Greenpeace: Protecting old-growth forests," *Staff in Stora Enso: A Magazine for Stora Enso Group Personnel*, September 2003.

Sample, V. Alaric, "Invasive Species: Conserving Biological Diversity in Reunited Gondwanaland," *The Pinchot Letter*, Pinchot Institute for Conservation, Vol. 8, No. 3, Winter 2003.

Silva Forest Foundation. Hammond, Sue. Executive Director – Email Correspondence. March 24, 2004.

Smith, Dana, *Chipping Forests & Jobs: a report on the economic and environmental impacts of chipmills in the Southeast*, 1997. <www.rethinkpaper.org/content/content.cfm?pagename=forestissues >

Smith, Maureen, *The U.S. Paper Industry and Sustainable Production: An Argument for Restructuring*, (Cambridge: The MIT Press, 1997)

Snyder, Michael. Forester – Email Correspondence. March 3, 2004.

Society of American Foresters, *Task Force Report on Biological Diversity in Forest Ecosystems*, 1991.

Stora Enso. Fries, Mark. – Email Correspondence. April 8, 2004.

Stora Enso, *Wood and Fibre: Renewable and Recyclable*, Stora Enso Environmental Communications, Finland.

Taiga Rescue Network, *Annual Report 2001*. <www.taigarescue.org/_v3/files/pdf/29.pdf>

United Nations General Assembly, "Statement of Principles for the Sustainable Management of Forests," Proceedings: United Nations Conference on Environment and Development, Earth Summit, Brazil, 1992. <www.un.org/documents/ga/conf151/aconf15126-3annex3.htm>

World Business Council for Sustainable Development (WBCSD), *Towards a Sustainable Paper Cycle*, 1996. <www.iied.org/eep/pubs/execsumm/wbcsd0004.html>